THE

JOURNAL

OF

THE ASIATIC SOCIETY

OF

BENGAL.

VOL. I.

THE

JOURNAL

OF

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OF

BENGAL.

EDITED BY

JAMES PRINSEP, F. R. S.

SECRETARY OF THE PHYSICAL CLASS, ASIATIC SOCIETY.

VOL. I.

JANUARY TO DECEMBER,

1832.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."

SIR WM. JONES.

Calcutta:

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1832.

TO

CAPTAIN JAMES D. HERBERT,

Bengal Infantry,

LATE

DEPUTY SURVEYOR GENERAL OF BENGAL, AND SUPERINTENDENT OF REVENUE SURVEYS;

AT PRESENT HOLDING THE APPOINTMENT OF

ASTRONOMER TO HIS MAJESTY

The King of Oude;

WHOSE JUDGMENT ORIGINATED; WHOSE PERSEVERANCE AND EXERTIONS SUCCESSFULLY ESTABLISHED; AND WHOSE SUPERIOR ABILITIES SUPPORTED FOR 3 YEARS,

THE FIRST JOURNAL

IN INDIA

DEVOTED TO THE EXCLUSIVE PUBLICATION

OF

GLEANINGS IN SCIENCE;

THIS VOLUME,

IN ALL RESPECTS, BUT TITLE, A CONTINUATION OF HIS OWN WORK,

IS

Inscribed,

BY HIS ATTACHED FRIEND,

THE EDITOR.

CALCUTTA,
January 1, 1833.

PREFACE.

The Asiatic Society, on the 7th March, 1832*, passed a resolution, that the monthly journal hitherto published under the name of "Gleanings in Science," should be permitted to assume that of Journal of the Asiatic Society, and to continue it as long as the publication remains under the charge of one or both of the Secretaries of the Society. This privilege has, as it was anticipated, been the means of extending very considerably its circulation, while it has given a character and authenticity to the work, by its connection with an institution of established literary reputation, which no anonymous magazine, however well conducted, could hope to command.

The advantages of extended circulation have reacted to the benefit of subscribers, by enabling the Editor to increase the quantity of letter press from 400 to nearly 600 pages; and yet so constant has been the growing support of its contributors, that the pages of the Journal have been devoted, with few exceptions, to the insertion of original communications.

To many readers it would doubtless have been preferable that the Journal should contain more copious extracts from English scientific periodicals, which are not procurable in the interior of India; but conceding that, as an organ of Indian scientific intelligence, it must obviously derive its only merit among the many similar periodicals of the present day, from its stores of *oriental* literary and physical research, it will be generally acknowledged, that the first object of the work should be to give publicity to such oriental matter as the antiquarian, the linguist, the traveller, and the naturalist may glean, in the ample field open to their industry in this part of the world. While acting

* The January number was not published until the middle of March.—Since then exertions have been made to bring up arrears, and in future each monthly number will appear with regularity on the 10th of the following month; the insertion of the meteorological register rendering an earlier issue impossible.

on this principle, however, the Editor has not lost sight of the great utility of following, as far as means would permit, the progress of the various sciences at home, especially such as are connected in any way with Asia; the only limits thereto being want of space, and want of time to peruse and extract from the vast number of publications of the present day. Want of room also precluded the possibility of republishing the proceedings of the Medical and of the Horticultural Societies; but this had become less urgent since both of those useful bodies adopted the excellent rule of giving early publicity to their own proceedings and records.

To the Asiatic Society THE JOURNAL has naturally looked for its most frequent and interesting communications; and in consequence of its more intimate connection with that Institution, the proceedings of that body have been given in greater detail than heretofore, so that absent members may learn exactly what passes at its meetings, and what accessions are made from time to time to its library and its museum. Many absent members have complained of the quarterly subscriptions they were heretofore called upon to pay, while they remained in ignorance of what was going forward; this source of objection is now obviated, and perhaps a still greater amendment may yet be effected for their benefit, by an arrangement that all-members of the Society shall receive a copy of the Journal gratis, which will reduce their annual payments nearly one fourth.

It is unnecessary to recapitulate the contents of the present volume, or to allude in anonymous praise to those who have favored its pages with their assistance; since the authors have, in most cases, on suggestion, permitted their writings to be authenticated by the insertion of their names, as should always be the case in matters of fact, observation, and research. One illustrious name however must not be passed over without a tribute of gratitude for its valued and frequent contributions, a tribute more sincerely paid, since India has now lost the power and the claim to their continuance; she has resigned her most eminent oriental scholar to climes where his talents may find more genial appreciation, but where they cannot excite more respect or admiration, than they will ever command in the land which called forth their energies and directed their application.

The learned Societies at home will be proud to publish the continuation of the *Analyses of the Puránas*, of which the four first have appeared in these pages. Abstracts of four only were ready for the press, but translations of the remainder of the eighteen *Puránas* themselves had been completed under the superintendence of Professor Wilson, before he quitted India.

Mr. Alexander Csoma's indefatigable labour, in opening to us a first acquaintance with the literature of Tibet, will be estimated as it deserves by literary men—a contracted circle perhaps, because deep erudition and study are requisite to form critics capable of appreciating the nature and bearing of his peculiar researches upon the history, languages, and religions of other nations, both ancient and modern. All may however feel sensible of the devotion, zeal, and perseverance, which are necessary to lead a man, alone and unpaid, into a distant and wild country, to learn its language, and study its people at the fountain head. The volumes of notes which Mr. Csoma has presented to the Asiatic Society, will, it is hoped, be published in their Researches at length.

In furtherance of the desire of the Government, the greater part of Dr. Buchanan's Statistics of Dinajpúr has been printed in a detached form, as commenced by the Editor of the GLEANINGS; and to complete the work more speedily, two extra numbers have been issued in the course of the year. It will be remarked, that there are many plates referred to in the text: the drawings alluded to are in possession of the Honorable Court of Directors, along with the original manuscripts; it was thought better to preserve the references, in case the Hon'ble Court might hereafter be persuaded to publish them, either in a separate form, or of a size adapted to the present edition. It must not be forgotten, that it is this undertaking which gained to the GLEANINGS the valuable privilege of free postage through the Bengal Presidency. The Editor is happy to announce, that the same boon has, in the most liberal manner, and without any solicitation, been extended to the Presidency of Bombay and to the Government of Ceylon, by their enlightened Governors, His Excellency the Earl of CLARE, and the Right Honorable Sir R. W. HORTON, to whom his thanks are thus publicly and respectfully addressed.

To his numerous correspondents, the Editor can but proffer thanks for past, and solicitations for future, support, bidding them remember that, the scope and object of this publication embraces the literature, the manners, the geography, physical and mineral, the arts, the natural productions of Asia, the phenomena of its climate, and observations of the heavens. In the words of the illustrious founder of the Asiatic Society, " the bounds of its investigation will be the geographical limits of Asia; and within these limits its inquiries will be extended to whatever is performed by man or produced by nature."

Dedicated, by permission, to

LADY W. C. BENTINCK,

A

TREATISE

ON

THE MUSIC OF HINDOOSTAN,

COMPRISING A DETAIL OF

THE ANCIENT THEORY

AND

MODERN PRACTICE.

THE similarity of the music of Egypt and Greece to that of this country has been traced and pointed out: harmony and melody have been compared: and time noticed. The varieties of song have been enumerated, and the character of each detailed: a brief account of the principal Musicians superadded, and the work concluded with a short alphabetical glossary of the most useful musical *Terms*.

BY

CAPTAIN N. WILLARD,

Commanding in the Service of H. H. the Nuwab of Banda.

Price to Subscribers, Sa. Rs. 8.

PROSPECTUS.

A TREATISE on the Music of Hindoostan was much wanted. The scanty information obtainable through the channels of Dr. GILCHRIST and Sir WILLIAM JONES, are neither of themselves sufficient to fill this chasm, nor do they elicit light sufficient to enable one to grope through the various obscure writings in the vernacular languages and dialects. The songs set to music by Mr. BIRD and Mr. WALKIER, are of the more modern style, and not of the ancient school; so that, instead of elucidating the theory, they lead us into confusion, when compared with the tables of Rags and Raginees given by Sir W. JONES.

The forthcoming work has been written with the view of describing in some measure, the theory and practice of the original music of Hindoostan, but chiefly to unfold the beauties of which it is susceptible. The extravagant eulogium offered to the music of ancient Greece, and the striking similarity which appeared to the author to exist between that and the subject to be treated of in this work, has led him to point them out, in the hope that, should a taste for the music of this country obtain among the professors of the science in Europe, it might perhaps conduce to the elucidation and revival of a much-desired and lost branch of knowledge, namely, the music of ancient Egypt and Greece.

For this purpose it appeared to the author, that a bare translation of any of the existing native works would not suffice. All who have been taught music are so much accustomed to the European way of explaining it, that every other must necessarily appear uncouth and preposterous. In the arrangement of this work, therefore, the European system has been adopted.

CONTENTS.

N. B. *The work will be printed on superior English paper, at the Baptist Mission Press, Calcutta.*

Subscriptions will be received by Mr. A. Jewell, Moorghehuttah, and Messrs. Thacker and Co. St. Andrew's Library.

CONTENTS.

No. 1.—JANUARY.

No. 2.—FEBRUARY.

No. 3.—MARCH.

No. 4.—APRIL.

No. 5.—MAY.

DIRECTIONS TO THE BINDER.

The sheets of Buchanan's Statistics are to be separated from the monthly numbers. The Plates may either be bound up at the end of the volume, or in the following order :

ERRATA.

Page 10 line 9 *for* "wool," *read* "wood."
—— 11 — 7 *from bottom, for* "plate 1, fig. 2," *read* "plate 2, fig. 1."
—— 14 *last line, for* "delomite," *read* "dolomite."
—— 19 — 16 *from bottom, for* "3, 4, 5," *read* "1, 2, 3, 4."
—— 20 — 8 *from top, for* "plate 1," *read* "plate 2."
—— 20 — 9 *for* "he protracted," *read* "the protracted."
—— — — 11 *for* "BB′ B′," *read* "B″ B′."
—— — — 16 *for* "intercepts," *rsad* "intersects."

AND

In Fig 2, *plate II.* continue the dotted arc 1′ 1 *a″* to *a′*.
The line A *c′* continue to *c*.

—— 28 — 7 *from top, for* "manima," *read* "minima."
—— — *at bottom, for* "Artesien," *read* "Artesian."
—— 33 — 7 *for* "January," *read* "February."
—— 410 — — *in last column* of Table II. *for* "2m. 58s. 8," *read* "0m. 58s. 8."
—— 46 — 18 *from top, after* "which" *insert* "comma."
—— — — — —————— "either" ditto.
—— 47 — 2 *from top, for* "have," *read* "has."
—— 57 — 12 *for* "$99\frac{1}{4}$ $99\frac{1}{2}$ $99\frac{3}{4}$," *read* "99^{1} 99^{2} 99^{3}."
—— 59 — 24 *and throughout the article, for* "sack," *read* "sac."
—— 60 — 4 "orbitar," *read* "orbital."
—— — — 10 "interval," *read* "internal."
—— — — 29 "lips," *read* "tips."
—— — — 34 *dele* "by."
—— 60 — 15 *for* "compressed and hard; before," *read* "compressed and hard before ;"
—— — — 28 *for* "lips," *read* "tips."
—— 62 — 11 *for* "this Chiru," *read* "the Chiru."
—— 63 — 10 *for* "bambdoidal," *read* "lambdoidal."
—— — — 14 *for* "malars," *read* "molars."
—— 65 — 8 *for* "$1\frac{1}{8}$," *read* "$\frac{3}{1\,6}$."
—— 67 — 2 *from bottom, after* "than," *read* "the."
—— 74 — 15 *for* "9°," *read* "9^{1}."
—— 75 — 21 *dele* "rufous," repeated.
—— 79 — 17 *from bottom, for* "done," *read* "donc."
—— 148 — — *foot note, for* "Rutboo," *read* "Kubboo."
—— 226 1st par. 5th line *for* "Ekadantashtra," *read* "Ekadanshtra,"
—— 226 4th „ 4th — *for* "Kridama," *read* "Srid'ama"
—— 229 2nd „ 5th — *for* "Vrishapati," *read* "Vrihaspati."
—— 231 — „ 3rd — *for* "Viswasé na" *read* "Viswakerma."
—— 238 — „ *after* "Ganges river," *insert* "at Gházipur."
—— 245 10 „ *from bottom, for* "it," *read* "the mirror."
—— — 1st „ 7th — *for* "He having," *read* "Having."
—— 296 line 3 *for* "but mostly," *read* "and,—"
—— — — 7 *for* "hydrogen. When," *read* "hydrogen, where."
—— 305 — 20 *for* "circumference," *read* "diameter."
—— — — 21 *for* "$27\frac{1}{2}$ rupees," *read* "$2\frac{1}{2}$ rupees."

Errata in Meteorological Register, for June.

Date	Hour.		Bar.		
13	Sun-rise,	*for*	,365	*read*	,465
14	„		,399		,499
22	„		,517		,617

Add 0,010 to all the figures in the Barometrical column for 10½ P. M.

—— 340 — 6 *after* "*Rhinolphus*," *insert* "and two species of *Vespertilio*."
—— 355 — 13 *for* "ακαυσα," *read* "ακαυστα."
—— 355 — 2 *from bottom, after* "*nilam*," *insert* "*nil mani*, (or *manik*.)"
—— 356 *after* "College of Fort William," *insert* "the word *bahrmani* is also used in the *Khawás-ul* [illegible]*ir*, as a variety of the *yaqút*."
—— 358 — 20 *dele* "or a species of garnet."
—— 358 — 22 *for* "*manik*," *read lâlrí*."
—— 403 — 5 *from bottom, for* "ΔΙΟΚΑΠ," *read* "ΔΙΟΚΑΗ."
—— 404 — 14 *for* OVA," *read* "OTA."
—— 411 — 8 *for* "Latitude 25° 43′," *read* "Lat. 25° 47′ 26″."

In Table IV. of the Estimate of Life in India, page 284, the first four figures in the second and third column should stand thus :

Age.	Survivors.	Deaths.
20	52221	473
21	51748	489
22	51259	522
23	50737	557

The mistake arose from the calculations having originally been made to commence with the age of nineteen, instead of twenty: and the 5 year averages in Table III. page 283, will all be slightly affected by the same cause. The last figure in the second column, page 284, should be reversed; and in the last column but one, *for* "2080," *read* "2008."

Line 414 line 3 *from below, for* "molluscæ," *read* "mollusca."
—— 444 — 36 *after* "ministry," *insert* "of a man."
—— 445 — 3 *from below, for* "2125," *read* "212.5."
—— 446 — 7 *for* "in bullion," *read* "bullion."
—— 447 — 21 *for* "will be," *read* "would be."
—— — — — *after* "at any," *insert* "rate."
—— 480 — 15-16 *for* "Tariqa-i-Chishíta," *read* "Taríqa-i-Chishtía."
—— 483 — 36 *for* "lost about," *read* "tost about."
—— — — 39 *for* "Mújtahid-i-mústuqill," *read* "Mújtahid-i-mústaqill."
—— 485 — 20 *for* "Taqwiat-ul-Imám," *read* Taqwiat-ul-Imán."
—— 487 — 15 *erase* "5" at beginning of line.
—— 488 — 7 *for* "differences," *read* "difference."
—— 489 — 20 *for* "Káfr," *read* "Kufr."
—— 491 — 23-24 *for* Ishrák f'il Tasarraf," *read* "Ishrák f'il Tasarruf."
—— 492 — 10-11 *for* "the authority or influence of Saints, as respecting intercessors," *read* "respecting the authority or influence of Saints as intercessors."
—— 498 — 23 *for* "Khátim," *read* "Khátima."
—— 501 — 12 *after* "A B C," *insert* "[fig. 5.]"
—— 505 — 20 *for* "5 53 59," *read* "5 52 59."
—— 506 — 11 *for* "5 53 10," *read* "5 53 27."

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 9.—September, 1832.

I.—*Analysis of the* Kah-gyur. *By* H. H. Wilson, *Sec. As. Society.*

(Continued from page 8.)

Sher-chin.

At a former meeting of the Society, a summary of the contents of the Dul-vá, or first part of the large Tibetan collection, the Kah-gyur, derived from the more detailed catalogue of Mr. Csoma de Körös, was presented to the Society. Since that period Mr. Csoma has completed the catalogue of the whole work, and I propose on the present occasion to offer an abstract of the information thence obtained.

II.—The Sher-chin.

The second portion of the Kah-gyur is entitled the *Shes-rab kyi pha rol tu phyin pá*, or by contraction *Sher phyin*, pronounced *Sher-chin.* In Sanscrit *Aryá Bhagavatí Prajná Páramitá*, or simply *Prajná Páramitá*, the two first words implying the venerable goddess, epithets applied to *Prajná*, wisdom or understanding; also styled *Páramitá*, or that by the means of which life is traversed and emancipation obtained, from *Páram* beyond, and *Ita* gone; and which may be rendered therefore Transcendent or transcendental wisdom.

The Chinese explain it correctly, "le moyen de parvenir a l'autre rive par la science: parvenir a l'autre rive est une expression mystique pour indiquer—l'absorption du contemplatif et sa delivrance finale."—*Journal des Savans, Mai*, 1831.

This class consists of six different works, in twenty-one large volumes; of these, the first five all bear the same title *Aryá Bhagavatí Prajná Páramitá*, and are only discriminated by the titles expressing the number of stanzas which they contain. The sixth division is of a more miscellaneous character.

The first work, entitled the *Shes-rab kyi pha rol tu phyin pá—s'tong phrag Br. gya-pá* (or *H. bum*), or in Sanscrit *Aryá Bhagavatí Sata Sahasriká Prajná Páramitá*, consists as the designation imports of 100,000 *slokas* or stanzas. It occupies 12 volumes, divided into 75 books and 303 sections.

The second work is nothing more than an abridgement of the preceding, in which the number of stanzas is 25,000, whence its name the *Panchavinsati Sahasriká*. It occupies 3 volumes.

The third work is also an abridgement of the first, in 18,000 stanzas, or *Asthadasá Sahasriká*. It likewise occupies three volumes.

The fourth work in one volume is the *Dasá Sahasriká*, an abridgement of the second work in the collection, in which the 25,000 stanzas are reduced to 10,000; and the fifth work is a final abridgement of the whole, in which the number of stanzas is brought down to 8,000, contained in one volume.

The twenty-first and last volume of this division of the KAH-GYUR is entitled *S'na-ts-hogs*, or the miscellany. It comprises 18 different treatises, all of the class of *Sútras**, (original preceptive authorities,) and explanatory of the doctrines taught in the preceding volumes, in a summary form and commonly in verse.

As might be expected from their more compendious form, several of these are of more general currency than the original, and they may be regarded as the popular representations of the metaphysical speculations of Buddhism. Thus the fifth tract, entitled the *Vajrachhediká*, the cutter of adamant, in which the true sense of the *Prajná Páramitá* is explained by SÁKYA to his disciple SUBHUTI in 18 leaves, is frequently met with in Tibet, in a detached form. The five last treatises are denominated from the *Bodhisatwas*, to whom they are addressed, the *Prajná Páramitá* of *Surya-gerbha*, *Chandra-gerbha*, *Samanti-bhadra*, *Vajrapáni*, and *Vajraketú*. In one of the number, a specimen of mysticism occurs. It is called the *Prajná Páramitá Sarva Tathágata Ekakshari*, or the mono-literal transcendental wisdom of all the Buddhas, and refers the essence and origin of all things to the first letter of the alphabet, or A. For this being the first element of speech, all instruction is derived from it, all wisdom obtained, and it is hence to be regarded as the mother of the *Bodhisatwas*, the essential means of final liberation, and the substance of the *Prajná Páramitá*.

* Mr. HODGSON says, *Sútra* is often explained *Múla* (root) *Grantha*, and *Buddha vachana*, or words of Buddha.—As. R. vol. xvi.

A careful examination of the original *Prajná Páramitá*, or a translation of one of the abridgements of it, is the only means of determining the real purport of the native doctrine of the Buddhas, as taught by SÁKYA. It is indeed urgently required, in order to save many eminent scholars from the unsatisfactory labour of endeavouring to compose a regular system out of the *disjecta membra* placed within their reach, by the study of inferior authorities or oral communication*. It is to be hoped, therefore, that Mr. CSOMA may be prevailed upon to undertake the task, however difficult and irksome it may prove, not only from the inherent obscurity of the subject, but the very desultory and vague manner in which it is treated by SÁKYA, or his disciples—a style of discussion which renders it impossible to give a satisfactory analysis of the contents of the *Sher-chin*.

Speaking generally, the volumes of this division contain the metaphysical and psychological doctrines of the Bauddhas, as taught by SÁKYA to his pupils, and to other Bodhisatwas and Buddhas. There are especially one hundred and eight leading topics *(Dhermas)*, which with numerous subdivisions admit of argument, of affirmation and negation. Thus of aggregation or body, five predicates may be asserted —shape, perception, consciousness, faculty, and discrimination. The senses are said to be six—sight, hearing, smell, touch, taste, and understanding†; there are also six organs of sense, six objects, and eighteen regions. There are six elements, earth, water, fire, air, ether, and spirit, (or intellect†.)

There are twelve concatenated causes of existence, whether of matter or spirit—1. ignorance; 2. faculty; 3. discrimination; 4. definite form; 5. sensation; 6. perception; 7. knowledge; 8. desire; 9. privation; 10. vitality; 11. birth; 12. old age and death. There are six transcendental virtues—1. charity; 2. gentleness; 3. patience; 4. vigorous application; 5. meditation; 6. wisdom. To these four others are sometimes added—method, salutation or prayer, fortitude, and prescience.

* Mons. REMUSAT states in a note on his Review of Mr. HODGSON's Sketch of Buddhism, in the Transactions of the R.A. Society (Journal des Savans), that subsequently to its publication, "il a paru dans le Journal Asiatique, et dans les Memoires de l'Academie de Petersbourg, plusieurs morceaux ou l'existence d'un Dieu supreme, dans le Buddhism est discuteè contradictoirement."

† This is contrary to the statements hitherto published: disputed points between the Nyayikas and Bauddhas being the number of the organs, reckoned by the former, six, including mind, and by the latter, five, excluding mind; and the including of the *ákás* as a distinct element, which the Bauddhas do not recognise.

Of the great dogma of Buddhism, the determination of *Sunyatá*, emptiness or unreality, eighteen varieties are enumerated.

The specification of these varieties however does not furnish a very precise notion of what is meant, and it is not easy to understand what is intended by the doctrine that "nothing is," especially when associated with the eternity of matter, and even of an eternal first cause. In one point of view, it is a mere logical subtlety. All things are liable to change, the only state of which eternal identity can be predicated, is non-existence—nothingness. That which never is can never perish, and is therefore the only one enduring invariable principle in creation.

Sunyatá may also be regarded in a figurative sense, as the illusory nature of all corporeal and mundane existence.

These and the other speculations contained in these volumes are said to have been taught by SÁKYA in his 53rd year, 16 years after he had attained the degree of a Buddha, when he resided on the mountain of *Gridhra-kúta*, near *Raja Griha*. In some cases he delivers his instruction direct; in others he replies to questions put to him by propositions, which his disciples discuss, and thus elicit the answer for themselves.

The first compiler of the *Prajná Páramitá* was KASYAPA, the successor of SÁKYA in the hierarchy. The work was translated in the ninth century by the Indian pundits JINAMITRA and SURENDRA BODHI, and the Tibetan interpreter YE-SHES-DE. As I had occasion to notice, on a former occasion, the Society is in possession of the Sanscrit original of the *Sata Sahasriká*, or work in 100,000 stanzas; one entire copy and three sections of a second in the *Lan-ja* character; and one entire set in *Devanagari*, in five large volumes.

III.—PHAL-CH'HEN.

The third division of the KAH-GYUR is called in Tibetan *Sangsgyas phál po ch'he*, or by contraction *Phál ch'hen*. In Sanscrit *Buddha avatansaka*, the crest or diadem of the Buddhas.

In the general account of the KAH-GYUR, the term is given *Buddhavata-Sanga*, association of Buddhas, but the present is probably the correcter reading.

It is of much less extent than either of the preceding portions, containing only six volumes of a connected series, which detail in 45 sections legends relating to different *Tathágatas* and *Bodhisatwas*, and a description of the different regions of the universe, agreeably to Buddha cosmology, interspersed with recommendations of the moral practices of the system. These legends and lessons are narrated chiefly by

Sákya, either on the summit of mount *Meru*, or in the *Tushita* heaven; and accordingly are intended only for the benefit of the highest order of aspirants to the perfection of a Buddha.

This work is also termed a *Mahá Vaipulye Sútra* or Scripture of great extent: it was translated in the ninth century by the pundit Surendra Bodhi and Lotsava Bairotsana Rakshita.

IV.—Kon-tsegs.

The next division, although of no greater extent, is more diversified in its character, and contains in six volumes 44 different treatises; the whole collection is entitled *D. kon M. ch'hog Br. tsegs pá*, or simply *Kon-tsegs*. In Sanscrit *Retna-kúta*, the jewel peak, or pile of precious things. These precious things are the instructions of Sákya, on a variety of moral subjects, delivered by him on the mountain *Gridhra-kúta* to his disciples. Many of them are in the form of dialogues, and more are in the shape of a reply to a question put by one of the disciples. One of the inquirers is the Hindu sage Vyása, who is enlightened by Sákya on the topic of charity and alms-giving. Others are of all descriptions, from a Bodhisatwa to a young girl. The topics are various, generally moral, as in the first article on the three obligations; the eighth on the ten virtues: sometimes legendary, as the 5th, 6th, and 12th, which give an account of the regions of the Buddhas, *Amitábha* and *Akshobhya*, and the Bodhisatwa *Manjú Sri*. Treatise four is upon the interpretation of dreams. No. 13 describes the meeting of Sákya and his father Suddhodana, after the former had become a Buddha; and in number 20, Sákya explains to his disciple Upáli the order in which the chapters of the Dul-va are to be arranged.

The translations of the *Kon-tsegs* are regarded as the work of the ninth century, by the pundits Jinamitra, Surendra Bodhi, Danasila, and others, and the Tibetan interpreters Ye-shes-de, and D. Pul; Br. Tsegs.

V.—Do.

The next portion of the Kah-gyur is entitled *M. Do-de;* Sans. *Sútranta*, or simply, *M. Do Sútra*, a term implying properly aphorism or rule, but here applied to a collection of treatises considered as of an authoritative, preceptive, or scriptural character. According to one classification of the Kah-gyur, the *Do* class comprehends all the portions of the entire collection, except the *Gyut*, the last and Tántrika class; but in the present instance, as a distinct division, it comprises 251 different treatises, collected in 30 volumes.

They are all supposed to have proceeded originally from Sákya, and to have been committed to writing shortly after his death by his disciple

ANANDA. The first volume *B. skal, B. zang*, or *S. Bhadra Kalpika*, the age of happiness, is called also a *Mahá-yána Sútra*, or a great chariot precept: the phrase which is commonly used in Buddha literature to denote a scripture of the first order, the metaphor implying that such works act as conveyances to bear the spirit beyond the bounds of existence.

The principal subject of this work is the enumeration both in prose and verse of a thousand Buddhas, of whom four have existed, the rest are yet to come. The circumstances related of each of these are classed under 15 heads, or—1. his name; 2. the place of his nativity; 3. his tribe; 4. the extent to which the radiance emanating from him proceeds; 5. his father; 6. his mother; 7. his son; 8. his attendants; 9. the most intelligent of his disciples; 10. the one amongst his disciples best versed in working miracles; 11. the number of his disciples collected on any particular occasion; 12. the duration of his life; 13. the period during which his doctrine prevails; 14. the relics remaining of him; 15. the shrines built for their reception. About 300 leaves are occupied with these details; they are preceded by 150 on the general perfections of a Buddha, and are followed by about 100, describing the first step taken by the Buddhas particularised to attain divine perfection. The work is supposed to have been repeated by SÁKYA in reply to the questions of a *Bodhisatwa*, and in the presence of a large concourse of followers of both sexes, gods, demons, Bodhisatwas, and Buddhas, in a grove between Sravasti and Vaisali.

In the enumeration of the Buddhas anterior to SÁKYA in this volume, it is worthy of remark, that only three are specified, or KRAKUCHCHANDA, KANAKA, and KASYAPA. SÁKYA is the fourth. It would seem from this, that the existence of the three first of other lists VIPASYI, SIKHI, and VISWABHU' was not universally recognised in Tibet, any more than in Ceylon or to the eastward.

According to Mr. Schmidt, they do not occur in the Buddhist writings of the Mongols, but this seems doubtful, and Mons. REMUSAT states that they are specified in Chinese works.

The second volume of the *Do* class is chiefly occupied with the *Lalita Vistára*, or the account of SÁKYA, a piece of autobiography, related at the request of the gods by the sage himself. It is unnecessary to advert to it more particularly, as it furnished many of the details read at the last meeting on the subject of SÁKYA's life and actions. It is one of HODGSON's nine *Dhermas*.

The volume contains also three other short works, yet nevertheless styled *Mahá-yána Sútras*—1. *Arya Manjúsri vikrídita; 2. Arya Man-*

jásri vikurvána ; 3. *Buddha kshetra nirdésa.* The two first relate to the actions and past lives of MANJU' SRI', a Bodhisatwa of some repute, who is the chief interlocutor in them with SÁKYA. The third is an account of the virtues of the place of Buddha's abode. These tracts contain various metaphysical discussions on the nature of life and spirit.

The third volume contains two works. The abridged title of the first may be *Bhagavan jnyána retna*, the jewel of the holy wisdom of Buddha. In this the omniscience of SÁKYA is eulogised and illustrated, first by his disciple GANG-PO, in a course of instruction given to a pious householder at a fabulous city called 'Excellent Virtue,' and afterwards by the *Nágas*. SÁKYA himself gives proofs of his power, as well as explanations of his doctrines, to both his new and old disciples.

The second work *Sarva Buddha jnyána áloka alankára*, the ornament of the light of knowledge of all the Buddhas, originated in a question put by MANJU' SRI' to SÁKYA, as to the meaning of the phrase, There is no beginning nor end to a *Tathágata ;* or in other words, a Buddha is subject to neither life nor death. SÁKYA in reply maintains argumentatively the superiority and imperishableness of all the Buddhas.

The fourth volume comprises five different works of comparatively small extent and little importance ; the two first are explanations of the doctrines delivered by SÁKYA to his disciples. The third contains a dialogue between SÁKYA and a little child found in a deserted house, and whom SÁKYA instructs in the usual topics. In the fourth, a Bodhisatwa describes the different regions of the Buddhas ; and the last, entitled 'the eight *Mandalas*,' contains little more than a recommendation to make these *Mandalas* or diagrams, as the means of securing prosperity ; a rite which belongs to the mystical rather than the metaphysical class of Bauddha notions.

The fifth volume comprises three different works. In the first, the *Sandhi nirmochana*, or resolution of combinations, an assemblage of Bodhisatwas is described ; several of whom propose subjects to SÁKYA, on which he expatiates.

Thus in the ninth chapter, SÁKYA at the request of AVALOKITESWARA explains the ten *bhumis* or stages of perfectibility of a Bodhisatwa and Buddha ; and in the 10th, SÁKYA expounds to MANJU' SRI' the meaning of the term *Dherma káya*, the body or substance of righteousness. The second treatise, the *Lankávatára*, contains the doctrines taught by SÁKYA to a prince of *Lanka ;* and the third explains the meaning of the term Bodhisatwa given by SÁKYA to MANJU' SRI' on the hill *Gaya Sirsha*, whence it is called the *Gaya Sirsha Mahá-yána Sútra.*

The sixth volume has three treatises. The first discusses the nature of life and the soul: the second is of mixed character, being as much legendary as philosophical; it is termed *Mahá karuna pundaríka*, and describes the approaching death of SÁKYA, and the conversations that took place between him and his disciples or the gods.

Thus on BRAHMA's coming to condole with him, SÁKYA asks him who was the creator of all things, and whether he had any hand in creation. BRAHMÁ declares that he had none, and in turn inquires the birth of SÁKYA. The sage replies, that creation depends upon the acts of created beings; that is, as long as retributive justice is rendered necessary by the weakness or vices of existent beings, they must continue to be born and die, and the world consequently to endure. He adds also, that the whole is illusion, there is no reality, all is *Sunyatá*, or emptiness; he then dismisses BRAHMÁ, desiring him to take care of the world on his behalf.

SÁKYA then gives instructions to his pupils ANANDA and KASYÁPA, as to the dissemination and compilation of his doctrines, and desires them in communicating his oral lessons, to use this formula, "I myself heard this, at such a time when Chom-dan-das (SÁKYA) lectured at such or such a place, when his auditors were such or such persons, all of whom when the discourse was over rejoiced greatly, and concurred in his doctrines." The third treatise bears the same name *Karuná pundaríka*, and relates to the same subjects.

The seventh volume contains six different works. In the first, MAITREYA and MANJU' SRI' are introduced, discoursing on the marvellous perfection of SÁKYA, and the six great or transcendental virtues, charity, morality, patience, diligence, deep meditation, and clearness of intellect.

Other disciples appear in the work, of whom SÁKYA foretels the estimation in which they will be held. He also describes the conduct, and relates the lives of former TATHÁGATAS. The work is considered of high value, and is called SAD DHERMA PUNDARI'KA, the lotus of the piety of the holy. The other works in this volume are of a similar character. The fourth, the *Karanda vyúha*, is held in high veneration by the Tibetans, containing many eulogies by SÁKYA on CHENRE'SIK VÁNGCHHUK, their patron saint.

The ninth volume in like manner contains seven different works, and all to the same purpose. The two first were delivered by SÁKYA when on the point of death. The third or fourth, although ascribed originally to SÁKYA, are stated to have been rendered from Chinese

into Tibetan. The ninth volume contains six, and the tenth, seven different treatises.

Each of the succeeding volumes is similarly distributed amongst a greater or smaller number of different works. Thus, the 15th contains nineteen tracts, the 16th, eighteen, and the 26th, thirty-three. They are all of too similar a character to need particularization. Each is a lecture on some topic of Bauddha belief or practice, delivered by SÁKYA, at the request of some of his followers, or in reply to their inquiries. A few particulars of some of them may be noticed.

In the 13th volume and 14th article is narrated a dialogue between SÁKYA and an old woman at *Brij*. She puts many philosophical enquiries, to the astonishment of SÁKYA's pupil KUN-GAH-OO, on which SÁKYA tells him that she had been his mother in former ages for five hundred generations.

The 11th number of the 15th volume, the *Chandrottara dáriká Vyákarana*, contains a prophecy, that a girl named CHANDROTTARÁ and one of his followers shall become a Buddha; there are similar predictions of other persons in this volume.

In the *Lokana Samana Avatára*, the 19th article, in the same volume, SÁKYA explains to MANJU' SRI', his spiritual son, the considerations which induce the Buddhas to conform their practices to the conceptions of mankind.

The 19th volume commences with the *Dherma Sangíti*, or treatise on moral merit: in this, the different virtues are enumerated, and an account given of the advantages to be derived from their exercise. A discussion is also detailed between two Bodhisatwas on the nature of the *Tathágatas* or Buddhas, and in what sense the description of their birth, life, and death is to be received.

Most of the treatises in the 20th volume are intended for the benefit of the Bodhisatwas, and shew them by what moral and virtuous observances they may soonest attain the perfection and degree of a *Buddha*.

The first article in the 21st volume is entitled *Buddha náma sahasra pancha, sata chatúr, tri panchasat*, and is, as the name implies, the enumeration of 5,453 epithets of a Buddha or *Tathágata*, each being descriptive of some fancied or real excellence, and being accompanied with a reverential formula. Thus,

I adore the *Tathágata*, the universally radiant sun.

I adore the *Tathágata*, the moral wisdom.

I adore the *Tathágata*, the chief lamp of all the regions of space—and so on, for 137 leaves.

The second book in the 22nd volume, entitled *Achyuta Rájá*, gives an account of the periods of time prevailing in the different *Loka-dhátus*, or regions of different Buddhas.

The region of SÁKYA is the *Sahaloka dhátu*, the world of mortals under the viceregal supremacy of BRAHMÁ. In the same volume occurs the *Sapta Buddhaka Sútra*, in which the seven Buddhas VIPASYI and the rest, at the solicitation of a Bodhisatwa, appear and communicate *Mantras* severally for averting evil. Three other tracts are successively devoted to eight, ten, and twelve Buddhas, but these are the holy personages of the region, and have no connexion with SÁKYA and his direct predecessors.

The twentieth work, in the 22nd volume, commences the *Saddherma Smrityupasthána*, or the influence of recollection over the discharge of true virtue. The work is continued through the whole of the 23rd and 24th volumes, and the greater part of the 25th, and may be considered as the moral code of SÁKYA. In this he describes the ten virtuous and ten vicious acts, and their consequences; the different degrees of transmigration; the scale of rewards and punishments; the division of heaven and hell; as well as the suffering experienced in this world; and illustrates his subject by numerous legendary tales. These volumes contain little speculative matter, and belong to the external or practical portion of the Bauddha doctrines. The last portion of the 25th volume contains, amongst other treatises, two belonging to the *Esoteric* doctrine—on *Súnyatá* and *Mahá Súnyatá*, emptiness and great emptiness, or the total unreality of material existence.

The 1st article in the 26th volume is an account of the life and actions of SÁKYA, and of the origin of the SÁKYA race. The details agree generally with those in the 3rd volume of the DUL-VA, and in the 2nd of the Do class, or *Lalita Vistára*.

The 29th volume is occupied with four tracts, to three of which the term *Avadána* is applied: they are of a legendary character: thus, the *Suhárika Avadána* narrates the story of a divinity of one of the inferior heavens, named *Suhárika*, foreseeing that he is to become a hog in his next migration; his anticipated degradation plunges him into great distress, when he is advised by INDRA to have recourse to SÁKYA: he does so, and upon his death, not only escapes his threatened humiliation, but is elevated to a higher heaven, or that of *Tushita*.

The 30th volume contains 25 treatises, most of them legendary; the first five are in commendation of charity, the 11th is a narrative of SÁRD'ULANÁSA, the son of TRISANKU, a former chief of the *Súdra* race, who by his talents obtained the daughter of a celebrated Brah-

man for his wife. This story is related in justification of SÁKYA's disciple and successor ANANDA, who married a girl of the *Súdra* caste. The tract contains an enumeration of castes and citations of several Hindú works. In the 23rd and 24th, the *Surya* and *Chandra Sútras*, the sun and moon, apply to SÁKYA when seized by RÁHU, and are liberated from the demon at the command of the sage.

Two or three of these works are described as translated into Tibetan from Chinese, but with these exceptions they are rendered professedly from Sanscrit, and the names of the pundits and translators are given. They are much the same as those met with in the *Dul-va* class, or JINAMITRA, SURENDRA BODHI, DÁNA-SI'LA, PRAJNYÁVERMA, MUNIVERMA, &c. Few names of the *Lotsavas* or Tibetan interpreters are given; the chief is YE-SHES-DE, the translator of the *Lalita Vistára* and other principal articles in this class.

The *M. Do* class of the KAH-GYUR may be considered as that part of the course of Buddhist scriptures which is especially addressed to the lay votaries of this faith. It is not like the DUL-VA, intended for the guidance of the priests, nor is it like the SHER-CHIN, addressed to the philosophers, whilst it is also distinguished from the last great division of the *Kah-gyur*, by being free, with one or two slight exceptions, from any taint of mysticism. Although some of the treatises are of a speculative and metaphysical tendency, yet by far the greater number have a more practical bearing, and either in the legends they narrate or the lessons they convey, are evidently composed to enforce belief in SÁKYA, and consequent diligent practice of those virtues which it was the end of his mission to inculcate.

Several of the works contained in this collection belong to the *Nava Dharma*, or nine Dhermas, mentioned by Mr. HODGSON, as objects of adoration, as well as high authorities in Nepal; such are the *Lalita vistára*, *Lankávatára*, and *Sat Dherma Pundaríka*.

VI.—MYANG DAS.

The smallest division of the KAH-GYUR is the *Mya-nan-las-das-pá*, or *Myang Das:* in Sanscrit the *Maha-parinírvána*, or simply *Nirvána Sútra*. It is confined to two volumes, which give an account of the concluding scene of SÁKYA's life; his *Nirvána* or attainment of that state of spiritual quiescence which constitutes the *summum bonum* of the Buddhists. SÁKYA's death took place in Asam or *Kusa*. The possession of his relics was disputed by several of the cities and princes of India, and finally distributed amongst them. Stately *cháityas* or mausolea were erected for their reception.

VII.—GYUT.

The seventh and last portion of the KAH-GYUR is of a very different description from either of the preceding, constituting an extensive collection of works on mystical worship, corresponding to the *Tántrika* system of the Hindús, from which it is probably derived. The works are also of a more modern date, and less legitimately Bauddha character. The series consists of 22 volumes, each containing a number of small tracts. Most of them as usual are ascribed to SÁKYA.

The first volume contains 14 works, the first of which is an enumeration of the names of MANJU' SRI', a person who was very possibly concerned in grafting *Tantra* rites on Buddhist speculations. The third work is called the *Paramádibuddha uddhrita Sri Kála Chakra*, a *Tantra* delivered by SÁKYA, at the request of DA-ZANG, a king of Shambhala, a fabulous city in the north; but the original is said to have proceeded from the first Supreme Buddha. It was introduced from the north, it is said, into India, in the 10th century, and into Tibet, in the 11th. How this is reconcileable with its being delivered by SÁKYA does not appear. Its modern date is unquestionable, as it makes mention of *Mekka*, and describes, in the form of a prophecy, it is true, the rise, progress, and decline of the Mohammedan religion. The work contains a variety of details in cosmography, astronomy, and chronology.

The second volume contains four works, the *Laghu-samvara*, the *Abhidhána*, the *Samvara*, and *Vajra Daka*, in which the worship of certain spirits, as HERUKA, SAMVARA, and VAJRA-DAKA, with that of the female sprites and witches of the *Tantras*, the YOGI'NIS and DÁKINIS, is enjoined, and the *Mantras*, or mystical formulæ for invoking them, communicated. These different beings are considered equal to the Buddhas in power and sanctity by some classes of Buddhists.

The third volume has also four works of similar purport. In the first the *Herúka Anubhúta*, or appearance of HERU'KA the speaker, is VAJRASATWA, also styled SAMVARA and BHAGAVÁN, who, in answer to the questions of VÁRÁHI', a goddess, explains her origin, her names, the import of the male and female symbols (*Linga* and *Bhaga*), the mystical power of different letters, illusion and union by YOGA with the deity: this and the other tracts also describe the different divinities worshipped, the *mandalas* or diagrams to be formed, and the *Mantras* to be repeated. The *Mantras* are also given, that of *Vajraváráhi* commences "*Om* Nama, goddess VAJRA-VÁRÁHI', holy and invincible mother of the three worlds. Great goddess of all wisdom,

the remover of terror from all created beings." This *Mantra* is reputed to be of peculiar sanctity and efficacy.

The first article of the fifth volume is the *Sri-chanda Mahároshana Tantra.* In this the *Bhagaván* Vajra-satwa instructs the Bhagavati' Prajnyá Páramitá how to worship the wrathful deity called Chanda Mahároshána, and in what manner a person may be initiated into the same knowledge by his spiritual guide. There are also speculations on the nature of body and spirit, and the means of re-uniting the human with the divine spiritual essence.

The first article of the sixth volume describes the subjugation of Nilambara-dhara, Vajrapáni and Indra, by Sákya. In the second, the *Mantras* of several Hindú gods are given, or *Om* Brahmá—*Om* Vishnu—*Om* salutation to Ru'dra—*Om* Kártikeya—*Om* Ganapati—*Om* salutation to Indra—*Om* Mahákála—*Om* salutation to Brahmá, and the like. In the fourth, especial injunctions are given to the novice, to persevere; the advantages of which are illustrated by the adage familiar to most nations, "In time a large stone is hollowed by small drops of water." "Gutta cavat lapidem non vi sed sæpe cadendo." In this also *Mantras* or incantations are given for procuring abundance, curing disease, overpowering an enemy, and the like.

The first and second tracts in the seventh volume are styled *Krishna Yamári, and Yamári Krishna Karma Sarva Chakra Siddhahara,* the black foe of Yamar, and the wheel of the black foe of Yama or death, for accomplishing all acts. The fourth is the *Rakta Yamári Tantra,* or of the red foe of death. The third is the *Vajra mahá Bhairava Tantra,* and fifth, *Bhagaván Ekajatá,* the god with the braid of hair: all, indications of close alliance with the followers of Siva.

In the ninth volume, the sixth article is the *Mahá Vairochana Abhisambodhi,* a work of some extent, and sometimes regarded as a *Sútra.* It is ascribed to the Bodhisatwa Vairochana, and was delivered by him at the request of Vajrapáni. The chief interest attaching to this work arises from its containing the passage published in Europe in 1722, and most egregiously mistranslated by European scholars, as described in a former number of the Journal.

The tenth volume contains some treatises that seem scarcely to belong properly to this division; they contain prayers ascribed to different *Tathágatas* for the welfare of all animal beings, and repeated by Sákya at the request of Manju' Sri'. There are indeed many such tracts in the collection, some of which are met with in the other divisions, as the 4th and 8th of the 11th volume, the *Vipula pravesa,*

which occurred previously in the 2nd volume of the DUL-VA, and the *Sapta Buddhastava*, short prayers or *Mantras* attributed to each of the seven Buddhas which had a place in the 22nd volume of the Do class.

The fifteenth article in the 11th volume is one of the numerous proofs afforded by the catalogue of the intimate connexion of MANJU' SRI' with this part of the Buddhist ritual. It is styled *Aryá Manjú Srí Múla Tantra*, the primary *Tantra* of the holy MANJU' SRI'. It is described as delivered by SÁKYA in the highest heaven, in the course of a conversation with MANJU'SRI' in the presence of the assembled Bodhisatwas and gods. Besides descriptions of *Mandalas*, and of various ceremonies, accompanied with numerous *Mantras*, it contains a system of astrology, an account of the planets and lunar constellations, of lucky and unlucky periods, and the characters of men born under different planetary combinations. SÁKYA in this part of the work predicts the birth of some illustrious characters in Indian literature or history, as PÁNINI and CHANDRAGUPTA; also of some eminent personages in his own faith, as NÁGÁRJUNA and ARYA SANGA, entitled by Mr. CSOMA, the Aristotle and Plato of Buddhism, and said by him to be the teachers of comparatively rational systems, speculative or practical, in the *Madhyámika* and *Yogácharya* schools, of which they were severally the founders. NÁGÁRJUNA is a person who enjoys a very extensive but rather unintelligible celebrity in Hindustan. In the south of India, he is the reputed author of works on alchemical medicine, and in the introduction to the almanacks of Benares, he is commonly mentioned as the institutor of a *Sáka* or era yet to come, the last of the *Kali* age. Nothing else is known of him to the Hindús. According to the Bauddhas he flourished four centuries after SÁKYA, in the south of India, and lived 600 years, traditions evidently connected with those of the peninsula. ARYA SANGA, according to Mr. CSOMA, lived in the 6th or 7th century after Christ.

This *Tantra* is held in high estimation by Tibetan writers, and contains a number of interesting particulars relative to the princes of India, who fostered or who persecuted Buddhism. It was translated by order of a Raja of Tibet, named CHANG-CHU-BHOT, at Tholing, in Gu-ge above Gerhwal and Kamaon, in the 11th century, by KUMÁRA KALASA PUNDIT, and the GELONG, SÁKYA LO-GROS.

The 12th volume contains two works of the same name and substance, but differing in their source; one being translated from Chinese and the other from Sanscrit. The Tibetan title is, *Dehi shing kim kwang med jwahi shing wang kyang*. The Sanscrit, *Aryá Suverna prabhása*

Uttama Sútra Indra Rájá náma Mahávána Sútra, or the great holy *Yána Sútra*, the prince of the best of *Sútras*, resplendent as the radiance of gold. This is one of the nine *Dhermas* of the Nepalese, and is very popular with all Buddhists. It contains a course of dogmatic instruction delivered by SÁKYA at *Gridhra-kuta*, to his disciples and hearers, including the goddesses SARASWATI and LAKSHMI, and the four kings of Mount *Meru*, VAISRAVANA, DHRITARÁSHTRA, VIRU'DHAKA, and VIRU'PÁKSHA.

The 13th volume contains 71 different works: many of them are but of small extent; some of them not more than two or three verses, the greater number being *Dháranís*, short incantations, or prayers of supposed protective efficacy, and not unfrequently carried as amulets about the person. Thus the 25th article, the *Aparájitá Dháraní*, which occupies about eight leaves, is a collection of formulæ addressed to the different Buddhas, which are preservatives against thieves, water, fire, poison, weapons, foes, famine, disease, lightning, sudden death, earthquakes, meteors, princes, evil spirits, and gods. Articles 28, 29, and 30 are *Dháranís* for the cure of fever, ophthalmia, and hœmorrhoids, whilst they are preceded by the *Sarva roga prasaminí*, No. 27 a cure for every malady. Some of these are ceremonial, to be used on circumambulating or consecrating a temple or mausoleum. In 42, is a *Dháraní* for the augmentation of the understanding, *Prajná verdhani;* this occupies but one page. The chief secret lies in the repetition of the *Mantra*, *Namo retna trayáya*, *Namo aryá Avalokiteszaráya*, *Bodhisatwáya*, *Mahá Satwáya Mahá Karunikáya*, "Salutation to the Three Holies. Salutation to the venerable Bodhisatwa, the purified and compassionate *Avalokiteswara*." No. 65 is a *Dháraní* of two verses. No. 71 is a great *Dháraní*, *Mahá Dháraní*, delivered by SÁKYA to his disciple ANANDA, as a defence against all sorts of evils. These works are mostly ascribed to the same translators, as those of the large and more standard works; but Mr. CSOMA thinks they had no part in these translations, the subjects being so dissimilar, and it being universally admitted by Tibetan writers, that the princes of the 9th and succeeding centuries discouraged the promulgation of *Tántrika* works.

The 14th volume contains 53 works of a similar character in general as the preceding. From No. 3 to 10, they are lists of the names, 108 in number (like those of SIVA), of different characters, in the Buddhist mythology, or *Avalokiteswara*, *Maitreya*, *Akása-gerbha*, *Sámantabhadra*, *Vajrapáni*, *Manjú Srí*, *Sarvávarana*, *Vishkambhi*, *Kshetragerbha*. No. 15 is called the *Mahámegha*, the great cloud, being the name of a Buddha. In this a rather unusual office is assigned to

the *Nágas*, or serpents, the charge of the rains, which they are made to promise they will send down in due season, in *Jambudwípa*, or India. Nos. 18 and 19 are the *Mahá Ganapati Tantra* and *Ganapati Hridaya*, and describe the worship of GANESA, and the prayers sacred to him. Works with similar titles are not uncommon in Hindústan. The first was introduced into Tibet in the 11th century. No. 25 furnishes another analogy in nomenclature, being the *Devi Mahákálí Dháraní*. This goddess, however, is called the sister and wife of YAMA, the mother of MÁRA or Love, and queen of the region *Kámarúpa*. She is described as visiting SÁKYA, and receiving instructions and *Mantras* from him.

There are some other tracts on the same subject. Towards the end of the volume are several *Dháranís*, of which the hero is the Bodhisatwa AVALOKITESWARA or CHEN-RE-SIK, who is reputed to be the particular patron and tutelary divinity of Tibet. The last numbers are dedicated to the goddess TÁRÁ, the mother of all the *Tathágatas*, and origin of many things; her names (108) are enumerated, and worship described, and *Mantras* addressed to her repeated.

The fifteenth volume is chiefly devoted to the *Tántrika* worship of AMOGHAPÁSA and the goddesses SARASWATI and MAHÁSRI'. One article, the last, entitled *Bhuta damana*, treats on the means of bringing *Bhuts* or imps, ghosts and goblins, under human controul. Part of the process is the use of the sundry gesticulations known in the Hindú system by the term *Mudrá*.

The 18th volume contains but one work, the *Bhagavatí Aryá Tárá Múla Kalpa*:—a detailed description of the powers of TÁRÁ the goddess, the incantations addressed to her, and mode of offering her worship. It is attributed to SÁKYA, and was revealed by him to his disciples, when AVALOKITA was sent to him by AMITÁBHA from the *Sukhávati* region.

In the 19th volume, the two first works are the *Dháranis* of MÁNIBHADRA, the *Yaksha*, and son of KUVERA. The *Mantra* of this personage is *Namo Retna trayáya, Namo Manibhadráya Maháyaksha Senapatayè*. Salutation to the Holy Three—salutation to MANIBHADRA, general of the *Yaksha* host. The 12th article, *Sarva Mandala sámánya Vidhána*, or general ritual for all *Mandalas*, is a copious account of the figures of these diagrams, mode of making them, and ceremonies to be observed on the occasion. In one place the symbols of different deities to be placed in the divisions of the diagram are described, as a *trisul* or trident for RUDRA, a discus for VISHNU, a lotus for BRAHMÁ,

a spear for SAMVARA, a thunderbolt for INDRA, a furnace for AGNI, a club for YAMA, a sword for NAIRRITA, a noose for VARUNA, a banner for VAYU, a staff for KUVERA, &c. No. 14, the *Susidhikara Mahá Tantra*, is a work on the usual *Tantrika* subjects, but held in high estimation.

The 20th volume is interesting for its antiquated style, its different purport, and its being authority only with the *Nyig-má-pa*, the oldest Buddhist sect in Tibet. It contains three works ; the *Sarva dherma Mahásánti bodhi Chitta Kulaya Raja*, the royal instructor of the understanding in the great quiescence of all virtue. The second has a still longer title, with its equivalent not only in Tibetan but in what is called the *Bruzha* language, a language of which Mr. CSOMA could obtain no information. It is also said to be translated from that language. The third has a simple denomination, the mysteries of all the *Tathágatas*. It is regarded however as a continuation of the second. The mysticism of these works is of a different character from that of the others, and is doctrinal, not ceremonial. They also belong to theistical Buddhism, being revealed by the Supreme Soul, the Creator of all things, and who has existed from all eternity, in answer to the question of VAJRASATWA the chief of the five Buddhas, styled elsewhere the *Dhyáni* Buddhas. The first was translated in the 8th or 9th century by SRI SINHA PRABHA and the interpreter VAIROTSANA, the second (from the Bruzha language) by DHERMA BODHI DÁNA RAKSHITA and the interpreter CHHE'-TSAN-SKYES.

The 21st and 22nd volumes contain severally four and fifteen works of the same description as those which preceded the contents of the 20th ; they do not need any particular specification. In the fourth line of the 22nd volume directions are given for the representation of the five Buddhas, VAIROCHANA and others, with their symbols. The Buddhas, Bodhisatwas, and others, who are the interlocutors in these works, or the objects addressed by them, are as before VAJRASATWA, VAJRAPÁNI, MANJU' SRI', HERUKA, and VAJRADHARA. The doctrine or worship of Illusion or *Máyá* occurs in the *Vajrasatwa Máyá jála Guhya Sarvá dersha*, the mirror of the mysteries of the net of illusion of *Vajrasatwa*, the 3rd article of the 21st volume, and in the 1st of the 22nd, the *Mahamáyá Tantra*.

Thus terminates the great collection, the KAH-GYUR, a vast specimen of misdirected talent and time. Imperfect as the summary view given of its contents must necessarily be, it is evident from it, that there is no very great variety of subject, and that the general character of the composition is monotonous identity. The patience and perseverance

of Mr. CSOMA, in going over the whole of these bulky volumes in the manner he has done, will entitle him, I have no doubt, to the thanks not only of the Society, but of a considerable number of the learned of Europe, who are at this moment warmly interested in the investigation of Buddhism. He will have a still stronger claim upon their acknowledgments, if by the translation of some of the philosophical works, he enables them to appreciate what Buddhism really is.

Besides the catalogue of the KAH-GYUR, Mr. CSOMA has made occasional translations at my request, for the illustration of particular points. These are also submitted, as an account of the life and death of SÁKYA, the origin of the SÁKYA tribe, and some passages from the SHER-CHIN.

II.—*On the Ancient Roman Coins in the Cabinet of the Asiatic Society. By* James Prinsep, *Sec. Ph. Cl.*

(Read, July 4th.)

Having been lately engaged in decyphering the inscription of an antique copper coin found at Kanouj, by Mr. E. V. Irwin, C. S. and presented to us by Captain Sanders, Executive Engineer at Cawnpore, I was led into an examination of the contents of the Society's small cabinet itself, which, although it boasts but a very insignificant collection of Roman coins, and those mostly without any record of the exact localities in which they were found, or of the parties who presented them, is entitled to some interest from the circumstance of the Indian origin of all that it contains. It was not until the year 1814, that the Society opened a museum, and publicly invited contributions to it of the natural productions, antiquities, coins, and other curious monuments of the country: it is the less surprising, therefore, that its collection should not hitherto have attained any magnitude or consideration. Most private individuals, who have interested themselves in collecting medals and coins, have carried their spoil to England, where, indeed, they may be mortified in finding them swallowed up and lost among the immense profusion of similar objects in the public and private cabinets of European antiquarians; and they may perhaps regret that they did not leave them where, from their rarity, they would have been prized, and, from their presence, have promoted the acquisition of further stores for antiquarian research from the wide continent of India. The greater part of the late Colonel Mackenzie's collection was thus consigned to the museum of the Honorable Company in Leadenhall Street. Doctor Robert Tytler also presented to the same museum a

valuable cabinet, chiefly of Roman coins, procured by him with great industry while Civil Surgeon at Allahabad. Col. T. Wilson, C. B. lately carried hence some curious coins; and many other private collections might be mentioned, without alluding to the extensive cabinet of Major Tod, which cannot be said to be lost to India, but rather to be returned to us more valuable than before, through the plates and notes in elucidation of them published in the Royal Asiatic Society's Transactions.

The publication of a *catalogue raisonné* of the contents of our drawers, although it may expose our present poverty, will, I doubt not, by a wholesome re-action tend to our future enrichment, both by establishing a nucleus to which the antiquities henceforth discovered will be naturally attracted, and by affording to inquirers, who may not have the opportunity of consulting books on the subject, some clue, however insufficient, to the decyphering of worn and imperfect medallic remains, which appear to a novice to defy scrutiny.

We here possess the advantage of reference, in the Society's library, to the splendid numismatic works that were printed in Europe, during the last century, when numismatology was a favorite study. The copious volumes of Vaillant, Patin, Mezzabarba, Hunter, and Banduri, leave hardly a possibility of doubting the exact epoch of a Roman coin, when the device on either side, or a few letters only of the inscription are still visible. It is by means of these works, that I have been able to decypher and classify the greater part of the coins in the following catalogue:—I have added to the list several that were the private property of Mr. Wilson, Col. T. Wilson, or myself, found in different parts of India: I have also availed myself of a manuscript catalogue of the Society's coins, drawn up by Dr. R. Tytler, in the year 1826, which includes the mention of twelve Roman coins.

The number in the cabinet at present amounts to between 50 and 60: they extend in antiquity through a period of more than 1000 years, from the Augustan age down to the decline of the lower empire. The accompanying plates exhibit the greater number of them faithfully delineated, of their real dimensions and appearance, with all the defects of workmanship and the injuries of time. There are few among them which would be objects of primary interest among professed medallists at home, who, in the profusion of Roman coins every where discovered in Europe, are content with none but those of superior fabrication and high preservation, worthy of the titles of *medals* and *medallions of large and smaller mo-*

dulus, fancifully conferred upon them in their class books. We possess none of what are usually called *medallions* of "*large brass*:"—those beautiful specimens of the die-sculptor's art are supposed to have been struck less with a view to circulation as coin, than as memorials of state events and families of note. The pieces found in India are chiefly of the lower denominations, the common currency of the eastern part of the empire, and if it were allowable to argue from such insufficient data, the predominance among our specimens of the copper coin of Ægyptian fabrication confirms what is known from history, of that country having been the principal channel of commerce between India and the Roman Europe. Robertson says that specie was one of the principal returns in trade for the spices, precious stones, silk, &c. of India: it is not improbable, therefore, that the coin of the empire circulated to a considerable extent in India; and that there existed no native currency at an early period among the Hindús, we have the authority of Pausanias, and the silence of other authors on the subject: this supposition is supported by the almost, nay, total absence of the remains of any ancient Indian coinage. The Indian coins of Kanouj and the *Dekhan*, described by Mr. Wilson in the As. Res. and the Indo-Grecian coins of Major Tod, are evidently *descendants* from the Bactrian coinage, from the types of which they gradually progress into purely Hindú models; but these are comparatively scarce, and must soon have given place to the coins of the Muhamedan conquerors. Coinage is certainly one of the improvements which has travelled and is still travelling eastward. Thus we see, at the present day, countries immediately to the east of us, Ava and China, nearly destitute of fabricated money of their own; into the former of which our silver and copper currency is but now by degrees beginning to penetrate, while the latter along the coast is supplied with dollars from America; and, within perhaps a century or so*, in its north-western provinces with coin struck by the neighbouring frontier states of Nipal, Lahore, &c. for their use. But this is a digression involving questions of deep research, foreign to my present object, and which I am by no means prepared to discuss.

The symbols on the Roman coins, unlike those of the Greeks, are generally explained at once by the inscriptions encircling them: thus SALVS REIPVB, or SALVS AVG, accompanies the type of a female feeding the serpent of the goddess of health, at an altar: CONCORDIA, ABUNDANTIA, PROSPERITAS, &c. are all marked by the cornucopia; the ca-

* The Chinese provinces north of the Himalaya, Tibet, &c. were supplied with coin struck in the valley of Nipal.—*Dr. Bramley's Notes on Nipal Coinage.*

duceus expresses peace or commerce ; the pontifical hat, the priesthood; military standards and warriors, glory and victory : a fort, or gateway, security, &c. The eagle generally denotes the consecration of an emperor, as the *thensa* or divine chariot is the emblem of that of an empress. All, or the greater part, of the types on the reverse of the coins of the emperors have reference therefore to some attribute or event of their reign ; and when accompanied by the date of tribunate, consulate, imperial or pontifical elevation, &c. are so many imperishable testimonials of the truth of history. In not a few cases they have served to fill up blanks or to rectify doubtful events ; and they have brought down to our sight not only the record of facts, but the very portraits of the monarchs, heroes, law-givers, and authors, whose deeds and words form the delight of our studies from our youth upward. It may be regretted, that the Roman coins did not directly exhibit the calendric date, especially after the entire reformation of the calendar under the first of the Cæsars ; but with this sole exception what system of modern coinage, in the world, can stand a competition with the Roman or its prototype the Greek, the two earliest supposed to have been introduced among mankind ? If as a contrast we look but one moment at the system of coinage prevalent in the nineteenth century throughout the extensive provinces of India, what will it impart of the history of our time to after-ages, when all other records shall have perished, or shall want the confirmation of public monuments, and the cherishing memory of a proud posterity ? It will deceive them, as to the name and nation of the ruling power ; as to the date, and as to the place of coinage ! It will afford neither information, nor variety, nor beauty of design to gratify the curiosity of future antiquaries ; the very excellence of its fabrication will be thought to have been lavished on an object unworthy of a great and enlightened nation ! But this also is a digression, only excusable as it serves to enhance the value to us of the precious reliques of antiquity.

As the contents of our cabinet are to be regarded in the light of mere coin, a few remarks are necessary, to explain by what names they went and what value they represented ; this part of the subject is generally disregarded by writers on medals, properly so called, who look to their *numismatic* value only as elucidatory of history and the arts ; it has however received a very clear illustration in Pinkerton's Essay on Medals, from which we collect the following facts. The gold coin of Rome *(aureus)* varied gradually in weight from the Augustan æra to the close of the empire, though in a less degree than the coins of the other metals ; it was, under the first emperors, 110

grains in weight, passing for 25 silver denarii and 100 sestertii: it declined to 80 grains in Gallienus' time: Aurelian attempted in vain to restore its weight to 100 grains. Besides the term *aureus*, it generally took a cognomen from the emperor, whose image it bore, as is still the case with the coin of many modern countries. Constantine introduced a new name and system of subdivision of the gold coin, but maintained his *solidus* of gold of the same weight as the *aureus*, or 80 grains; it became current throughout Europe as the *Bezant* (from Byzantium), and gradually dwindled to less than half its size and value with the decline of the empire.

The principal silver coin of the republic was called *denarius:* it weighed 90 grains, and was worth, as its name implied, 10 copper *ases:* its subdivisions were the *quinarius (5 ases)*, and the *sestertius (half the third*, that is, $2\frac{1}{2}$ *ases)*. In the reign of Augustus the weight of both copper and silver coins had declined, and the *denarius* (then of 60 grs. weight) was made equivalent to 16 *as*. The *sestertius* thenceforward ceased to be a silver coin, and in lieu thereof, the handsome large brass medals, so prized by collectors, were first struck, weighing a Roman ounce. The silver *quinarius* (also called *victoriatus* from the common figure on its reverse) lasted to the time of the Philips. At that period the denarius having diminished to 40 grs. was called *minutus*, and a new piece called *argenteus philippeus* of 60 grs. or one-half heavier, was introduced as an equivalent for 24 *ases* of copper, or six brass *sestertii*. This again dwindled down to 40 grs. by the time of Gallienus, when all the inferior silver, as well as the large brass, disappeared entirely, and small silvered copper pieces *(denarii æris)*, weighing 60 grs. took the place of the sestertii, and passed current as tokens of 10 *ases* value; the silver *philippeus* itself being, as before, 60 *as*, or six of the plated denarii. Diocletian restored the *silver denarius* of 60 grs. and replaced the *denarius æris* by the *follis*, a new copper coin of $\frac{1}{2}$ an ounce, silvered or tinned: six of these as before were equal to the *denarius*, or to 60 copper *ases* of 60 grs. weight each.

Once more, the new *denarius* had declined to nearly 40 grs. by the time of Constantine, under whom its name was changed to *centenionalis*, so called because 100 pieces=1lb of silver, and a new 70 grs. piece was instituted, having the title of *milliarensis*, from 1000 pieces being equal in value to one pound of gold. The copper *follis* remained of half an oz. in weight, but 24 now went to the *milliarensis:* Numerous fractional parts of the latter also were made: the ημισυ φολεος, or $\frac{1}{2}$; τεταρτον, or $\frac{1}{4}$; οβολον, or $\frac{1}{12}$; ασαριον, or $\frac{1}{24}$, (now of only 20 grains,) and the νουμιον, or $\frac{1}{48}$; from this last coin, the marks upon

the copper pieces of the lower empire are supposed to be derived; thus the Greek numeral M. on a copper piece weighing ½ an ounce, shews it to be a *follis* or 40 *νουμια*: K stands for 20, I for 10, of the same unit, &c.

In describing the silver coin, I have unavoidably introduced as much notice of the copper coinage as is requisite for the purpose of recognizing, or naming, all that will come under review in the following catalogue. The *as.* was the *pysa*—the penny piece—of the Romans from first to last, merely declining in weight from one pound in the time of Servius Tullius, to half an ounce in that of Augustus, and to 20 grains in that of Constantine the Great.

The money of account was distinct from the coin, being estimated in *sestertii* and *sestertia;* the *sestertium* (*pondus*), or 2½ *centum denariorum* being equal to 100 *Sestertii*, or about £8 6 8 English money; but with this we have nothing to do at present, and it is high time to turn to the coins before us.

Gold Coins.

In the Asiatic Researches, vol. III. is a notice of the discovery of a number of Roman coins, chiefly of gold, of the second century, by a peasant, in digging the remains of what appeared to be an old Hindú temple near Nelore, 100 miles west of Madras, in the year 1787. Many were melted up as old gold, but 30 were recovered by *Nawab Amir-ul Amra*, who allowed the Governor of Madras, Mr. A. Davidson, to make a selection of two from the number for himself. He chose an *Adrian* and a *Faustina*, of which drawings were sent to the Asiatic Society. "Some of the *Trajans* were in good preservation, and many of the coins could never have been in circulation, they were so fresh and beautiful." This printed record is all that now remains in our archives of the interesting discovery:—the coins were probably brought to India by the Christian or Jewish refugees, who migrated to Mysore in the third and fourth centuries of our æra.

Pl. VII. *fig.* 1, A. D. 392. DN ARCADIVS PF AVG. *Dominus noster Arcadius pius filius Augustus.* Front face of the prince, juvenile, in helmet and armour: an equestrian device on the shield.

Reverse. NOVA SPES REIPVBLICÆ ⊖. below, CONOB.

Type. Victory seated, half naked, inscribing five crosses or XX XXX on a shield; a star on the left.

Weight 70 grs. troy:—The *solidus* of Constantine and his successors.—*As. Soc.*

This coin does not agree with any engraved in Bandurius or in Vaillant: it is however described by the former vol. ii. 529, with the difference of β in lieu of Θ, marking it of the second instead of the ninth year of his reign. The signification of the five X's does not appear to be understood, nor to whom *nova spes* refers, unless it was struck by the emperor Theodosius, on consecrating his son as Augustus. Bandurius entitles his similar coin *rarissimus*.

Fig. 2. A. D. 389. } DN ARCADIVS PF AVG. Head of a youthful prince looking to the left, with chaplet and toga.

Reverse. CONCORDIA AVGGG s *(an.* 8.)

Type. Helmeted female sitting on the prow of a ship, with spear in the right hand and a shield in the left, inscribed V O T V MVLX

Weight 65 grs. *Solidus.*—

This coin is depicted in Bandurius, page 527, *an.* H. It is, as all those with mention of votes, esteemed a very rare coin. It was given to me by Mr. Walter Ewer.

Silver Coins.

Fig. 3. B. C. 200. } ROMA ✕ on the exergue, or below the image of a head armed with a winged helmet; either of Pallas or of Dea Roma.

Reverse. On the exergue SGERII, an equestrian figure on the right, and traces of a pedestrian on the left. There is a hole through the coin: it is in the possession of Col. Wilson.

The ✕ probably denotes that this coin is the ancient *denarius*, which bore the impress X, (meaning 10 ases.) Pinkerton supposes that the value of the *denarius* was changed to 16 ases about 175 years before Christ; if so, this coin must be of very ancient fabrication, and it may be the more valuable, because none of precisely similar appearance is to be met with in the books to which reference has been made.

In the earliest times of the Roman coinage, the silver *denarius, quinarius,* and *sestertius,* all bore alike on the obverse the winged head of Pallas with the simple word ROMA, and the marks of value X, V, or HS respectively: and on the reverse, the mounted *Dioscuri,* or Castor and Pollux. Perhaps the present indistinct device may be of this nature, although from the epigraph it seems rather to point to some victory over the Germans. Perhaps the latter, which was indistinct, may have been SPQR. I am not able now to refer to the coin to decide this point.

Fig. 4. B. C. 1. } CÆSAR AVGVSTVS.....ATRIÆ. The first part of this inscription is barely visible, and a part of the coin is cut off. Well defined head of the emperor.

Reverse. ....L CÆSARES. The rest illegible.

Type. Two figures standing and supporting two shields, the one partly covering the other.

ROMAN COINS Pl I.

GOLD

SILVER

COPPER

J Prinsep del. et sculps.

This coin is doubtless the same as one described by Mediobarbus (page 39) of the 14th year of Augustus. The full inscription would then be C ÆSAR AVGVSTVS DIVI F PATER PATRIÆ. And on the reverse, below, or on the *exergue*, as it is called, "C et L CÆSARES (*Caius et Lucius*) AUGUSTI FILII COS DESIGNATI PRINCIPES JUVENTUTIS. *Type.* Duæ figuræ togatæ assistentes clypeis cum hastis puris."

Caius and Lucius, the sons of his daughter Julia, and Agrippa, were adopted by Augustus as his successors upon the birth of the latter (16 B. C.); were designated *principes juventutis* at twelve and thirteen years of age, and "*Consules post quinquennium*," Caius in B. C. 5, Lucius in B. C. 1. The present coin probably belongs to the latter year. The two princes died within four years after.

Fig. 5. A. D. 6. } TI CÆSAR DIVI AVG F AVGVSTVS. Head of the emperor Tiberius in good preservation.

Reverse. PONTIF MAXIM.

Type. A figure seated, (either the emperor, as officiating priest, or *Dea Clementia*;) a spear in the right hand, an olive branch in the left.

Weight 60 grs. The silver *denarius.—As. Soc.*

Tiberius Cæsar, the adopted son and successor of Augustus, was made *Pontifex Maximus* in the seventh year of his reign. Mediobarbus mentions but one silver coin corresponding with this in device; it must therefore be scarce and valuable.

Fig. 6. A. D. 70. } ..ASIANVS AVG COS II. V. P. Head, a good deal worn.

Reverse. SALVS AVG.

Type. A female figure standing before an altar, offering food to a serpent.

There is no coin of VESPASIAN in Mediobarbus exactly resembling this in type, and bearing the same date, but the device is common enough.

Fig. 7. A. D. 236. } ..MAXIMVS CÆSAR GER. Head of the emperor distinct.

Reverse. Illegible, probably *Princeps Juventutis.*

Type. An armed youth, standing.

C. Jul. Ver. Maximus was nominated *Cæsar* and *Princeps Juventutis* at the age of 18, by his father Maximus: he took the title of *Germanicus* with his father during their campaign in Germany, on the following year, when they were both killed in their tents.

Copper and Brass Coins.

Fig. 1. A. D. 14. } ...AVGVST...Well executed head of the emperor.

Reverse. S C [*senatus consultu*] enclosed in a wreath of laurel.

A brass coin, weighing 118 grains, or ¼ oz.; in value 1 as. None of the coins of Augustus enumerated in Mediobarbus precisely agree with this; those struck by

Tiberius, in honor of his apeotheosis, resemble it most; but the wreath in them was of oak, the inscription DIVVS AVGVSTVS.

B. C. 40, } CÆSAR AVGVST PONT MAX TRIBVNIC POT.
A. D. 19. } Head of Augustus without the laurel.

Reverse. S.C. encircled by III. VIR·A·A·A·F·F·P. LVRIVS AGRIPPA.

This is one of the coins denominated *nummi monetales*, bearing the name of the mint-master of the time, *Lurius Agrippa*. There were three prefects or moneyers in the Roman *ærarium*, one for each of the precious metals; as explained by the inscription *Triviri Aeris Argenti Aurique Flandi Feriundi* curam habuere. They were chosen from the members of the senate, and the names of nearly fifty mint-masters of those ancient times have been faithfully preserved on the coins of Augustus alone. A similar coin is depicted in the *Edin. Encyc. Numism.* Pl. cccxx.

Fig. 2. } ....ESAR·DIVI·AVG·F·AVGVS...Head of Tiberius
A. D. 15. } Cæsar facing the left.

Reverse. ..BVN POTEST XVII. PONTIF MA...In area S.C.

Type. A female figure seated, holding in one hand a cup, and in the other the *hasta pura*, or blunt spear.

Weight 165 grs. Copper; much worn.

This is known to belong to Tiberius from bearing his title of *Divi Augusti filius*. It agrees with a coin described in Mediobarbus, 64.

A. D. 84.—Legend illegible, head recognizable as that of Vespasian.

Reverse. S C, below ROMA.

Type. A square frame,—the gate of a temple?

Fig. 4. } MP TRAIANO AVG. GER. DAC PM. Head of the
A. D. 107. } emperor.

Reverse. Optimo prINCIPI. Most of the inscription effaced.

Type. Emperor standing with sceptre in left hand; right hand outstretched to a suppliant figure at his feet. In area S C.

Weight 368 grains. Brass *sestertius*—H. H. Wilson. *Med.* 157.

Trajan assumed the title of Dacius upon the reduction of Dacia, and its formation into a Roman province, A. D. 106. The type probably refers to the reduction of an insurrection on the following year.

Fig. 5. } HADRIANVS AVG COS III...Well executed
A. D. 137. } head.

Type. Figure of Victory holding a branch; no legend. S C on the area.

Weight 465 grains. Brass *sestertius.*

Mediobarbus explains, that coins of the emperor Hadrian, bearing only S C on the reverse, belong to the year A.V.C. 890, or A. D. 137.

Fig. 6.
A. D. 137. } haDRIANVS...Head similar to the last.

Type. Female standing, and holding a branch. S C in area.
Weight 174 grains. A copper *assarium.*

Pl. II. *fig.* 15. A. D. 200. } ΙΟΥΛΙΑ CΗβ Αcτη. Head of Julia Augusta, the wife of Septimius Severus.
Reverse. ΠΡΟΥC αε ΩΝ.
Type. A standing female figure, with spear and wreath.

Patinus (page 233) says, that of many cities of the name of Prusæ, the most probable one to strike a coin in honor of Julia was in Bithynia, near Mount Olympus: the coin is of brass and much worn.

A. D. 180.—A coin of one of the Antonines, by the appearance of the head, but the legend effaced. On the reverse, a trophy, S C. Copper.

Fig. 8. A. D. 226. } IMP ALEXANDER PIVS AVG. Wreathed head of emperor.
Reverse. PROVIDENTIA AVG ; in area S C. Female figure holding an ear of corn over a pannier; l. h. a cornucopia.
Weight 250 grains. Brass *sestertius. Med.* 321.

Alexander was called Pius in this year, on the opening of the Alexandrian baths.

Fig. 10. A. D. 231. } IMP ALEXANDER PIVS AVG. Head in good preservation.
Reverse. PM TR PX COS III SP. . Half naked figure of the Sun, with r. h. elated : in the left a whip or *flagrum.*

This coin is described in *Med.* 324, and was struck after a victory in Persia.

Fig. 9. A. D. 243. } . . GORDIANVS PIUS AVG. Much worn.
Reverse. A triumphant car drawn by four horses.
Weight 130 grs. Copper *assarium. Med.* 340.

Fig. 14. A. D. 263. } IMP GALLIENUS AVG. Only the lower part of the letters visible.
Reverse. APOLLINI CONS. AVG. A griffin *(monstrum alatum, Med.)* Described also in Bandurius I. 158, as a silver coin.
Weight 60 grs. Copper, or billion, [plated copper.] *denarius æris,* or *sestertius.*

This is the first of that peculiar system of coinage of silvered copper, the value of which has been so much contested by antiquaries; they are easily recognised by the rounding of the edges of the letters, probably done to prevent the silver covering being cut by the die. Gallienus' coins of this year are peculiar for land and sea monsters, supposed to refer to the Decennalia, then celebrated with great magnificence.

Fig. 13. A. D. ? } ..CARCINIA T..KUA. ? Face imperfect and illegible legend. I...A. Female figure standing.

Fig. 3. A. D. 268. } IMP CLAVDIVS AVG. Emperor's head in radiated crown.

Reverse. VIRTVS AVG.

Type. A soldier standing on the prow of a vessel, holding a branch in the right hand ; in the left, a spear.

Weight 55 grains. Copper, *denarius æris.*

Ditto. Another coin similar to the last, having on the reverse ÆQVITAS, with the figure of Justice holding a balance.

These coins were inserted in Plate I. under the impression that they belonged to Tiberius Claudius. It requires however but little knowledge of medals to perceive that they belong to Claudius Gothicus, who succeeded Gallienus.

Fig. 7. A. D. 268. } ..ICTORINUS PP AVG. Head with radiated crown.

Reverse. Illegible. Figure of Sol with r. h. outstretched.

Weight 35 grs. Copper.

This is a coin of *M. Aurel. Victorinus*, who was associated in the empire with *Posthumus Senior;* he killed the latter along with two other rivals, and reigned himself for six years.

Fig. 12. A. D. 270. } IMP C TET.....PF AVG. Radiated head.

Reverse. SALUS AVG. Female offering a cake to a serpent near an altar.

A coin of *C. Pesuvius Tetricus*, Præses of Gaul, under Aurelian, and nominated colleague in Italy with him.

Fig. 11. A. D. 275. } AKΛΔOM AYPHAIANOC ....emperor's head.

Reverse. L E (*an.* 5) with the head probably of Jupiter or Apollo: but belonging to a die of inferior size.

An Egyptian coin of *Imp. Cæs. Luc. Domit. Aurelianus Aug.* described in *Bandurius* I. 387.

The coins of the Roman Emperors bearing Greek inscriptions are of two kinds : those of the Grecian cities, provinces, and colonies had generally the name or insignia of the town where they were fabricated on the reverse, without any date : those coined in Egypt (at Alexandria), had invariably the date or year of the reign, in alphabetic numerals, on the reverse, with various devices, but no legend or epigraph. Some of them have a letter A or Δ below the type, supposed to designate the town or mint. It is necessary to bear in mind, that the numerals 1 2 3 4 5 6 7 8 9 10 11 20 30 40 50, &c. were represented in Greek by A B Γ Δ E Σ Z H Θ I IA K Λ M N. The ancient form of the Greek lambda L is supposed to stand for Λυκαβαντος, *anno* (*currente*) : sometimes, and

ROMAN COINS Pl. II.

COPPER

EGYPTIAN

J Prinsep del et sculps.

especially in coins of the *third* year, the word ETOYC *(anno)* is used in lieu of it, and the ninth year seems to be invariably expressed by ENATOY L (*nono anno*) instead of L Θ. I do not find any explanation of this circumstance, which is probably attributable to some superstition in Egypt respecting the mystical numbers 3 and 9.

Fig. 16. A. D. 277. } AKMAYP ΠPOBOC CEB *Imp. Cæs. Mar. Aur. Probus Augustus*, Head of the emperor rudely executed.

Reverse. LB, *an.* 2. An eagle bearing a laurel wreath.

Fig. 17. A. D. 283. } Same inscription, and device; L H, *anno* 8.

Probus was made Imperator of the East by the Emperor *Tacitus*, and recovered a part of Egypt and Persia which had revolted. The weight of these copper coins is 120 grains, or ¼ oz. They are therefore the *ασσαριον* or *οβολος* of the eastern empire.

Fig. 18. A. D. 282. } AKMAKAPINOC K. *Imp. Cæs. Mar. Aur. Carinus Cæs.*

Reverse... L A, *anno* 1. An eagle holding a wreath between two military standards.

Fig. 19. A. D. 283. } Same image and superscription of the Emp. Carinus.

Reverse... L B, *anno* 2. Female holding in the right hand a flower; in the left her robe. *Band.* 538.

This is a brass coin; it was dug up in the neighbourhood of Mirzapoor.

Fig. 20. A. D. 284. } AKMA NOYMEPIANOC CEB *Imp. Cæs. Mar. Aur. Numerianus Aug.*

Reverse... L B, *anno* 2. An armed and helmeted female sitting on a shield: r. h. an image of victory; l. h. a spear.

Weight 140 grs. Copper.

Numerianus, younger brother of *Carinus*, accompanied his father *Carus* in the Persian war: on his death, he succeeded to the empire, and reigned for two years.

Pl. III. *fig.* 24. A. D. 285. } AKΓOYΛ ΔIOKΛH.....*Imp. Cæs. Caius. Val. Diocletianus Aug.*

LB. *anno* 2. Female bearing a branch and a cornucopia; a star on the right.

A. D. 285.—Two similar coins of the same year, with Justice holding a balance.

Fig. 25. A. D. 286. } ....ΔIOKΛΠTIANOC CEB*αστος*. L Γ, *anno* 3.: Female with wreath and cornucopia.

Fig. 26. A. D. 287. } L Δ, *anno* 4. Female helmeted: r. h. a victory; l. h. cornucopia. A shield on the ground. *Band.* II. 39.

Fig. 27.— L Δ, *anno* 4. Legend illegible; r. h. an eagle?

Fig. 28. A. D. 291. } L Z, *anno* 7. Jupiter naked with a spear in the left hand, and thunder in the right; at his feet an eagle.

Fig. 29. A. D. 292. } L H, *anno* 8. Jupiter seated with the same accompaniments; beneath A. *Band.* 39.

Fig. 30.—L H, *anno* 8. Same type as fig. 28. *Band* 39.

Fig. 31. A. D. 293. } L ENATOY, *anno* 9. Female figure in tunic, holding a flower in the right hand; gathering her garment with the left: below A. *Band.* 39.

This coin was procured at Kanouj, by Mr. E. V. Irwin, C. S. and was presented to the Society by Captain Sanders, Engineers, 1832.

Fig. 32. A. D. 294. } L I, *anno* 10. The eagle bearing a wreath.

Weight 120 grs. Copper. This device is not in Bandurius.

Fig. 34. A. D. 284. } AKMA OVA MAΞIMIANOC CEB *Imp. Cæs. Mar. Aur. Maximianus Aug.*

L A, *anno* 1. Female holding an olive branch or flower, and a cornucopia. *Band.* 80.

Fig. 35.— L A, same device. Two cornucopiæ; star on the right.

Fig. 36. A. D. 285. } L B, *anno* 2. Similar device; star on the left.

Fig. 37. A. D. 290. } L S, *anno* 6. A winged female holding a flower wreath in the right hand, and a palm branch in the left.

L S, another in every respect similar.

L S, another belonging to J. P. *Band.* 81.

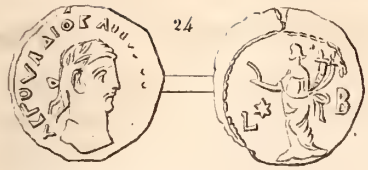
The above series of coins embraces ten years of Diocletian's, and six of his colleague Maximian's, reign. These two emperors called themselves the Jupiter and Hercules of the state, and frequently impressed the effigies of those gods upon their coins.

The fabrication of money, bearing Greek inscriptions in Egypt, ceased altogether in the twelfth year of the reign of Diocletian, A. D. 296, when Egypt was united to the rest of the empire by the defeat of the tyrant Achillæus; after which period, its coin bore the usual Latin legends. Our series reaches within two years of this date.

Pl. III. *Fig.* 33. } This coin was procured at the ruins of *Manikyala*, in the *Panjáb*, by Lieut. Burnes and Dr. Gerard, in 1832.

From the L S, and the appearance of the device, I supposed it to be a Roman coin of Egyptian fabrication of the second or third century: but on a closer examination, I am inclined to think, that it is a Bactrian coin, similar to those which are described by Mr. Wilson, in his paper on Indian coins in the As. Res. XVII. Pl. II. fig. 25. Their device is a figure on horseback, with arm outstretched; the L S, forms part of the head and ear of the horse, and the arch of his neck are faintly visible on the coin, although not represented in the plate, for want of shading. The *bandelettes* of the head on the obverse also agree better with the coins of the Bactrian dynasty, as well as the size and weight of the coin.

ROMAN COINS Pl. III.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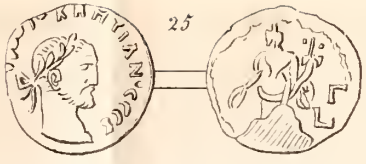
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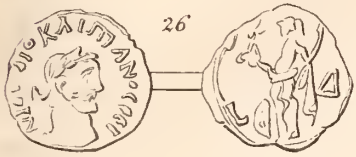
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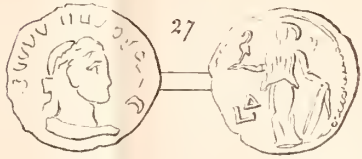
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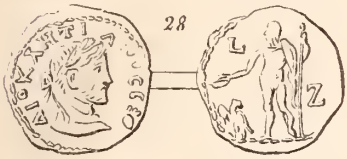
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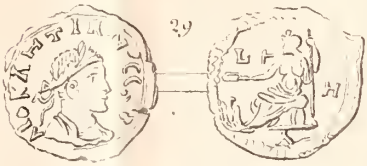
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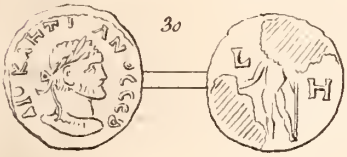
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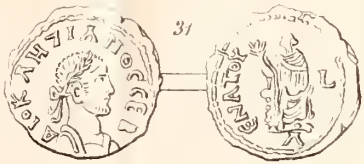
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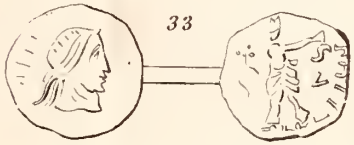
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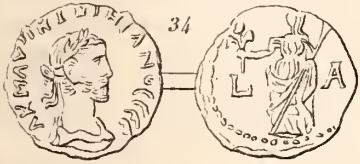
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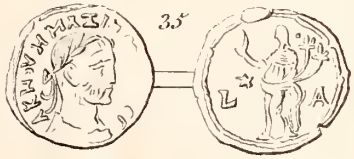
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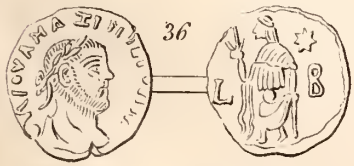
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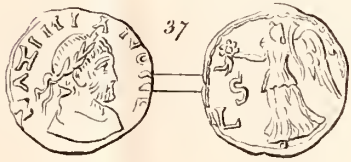
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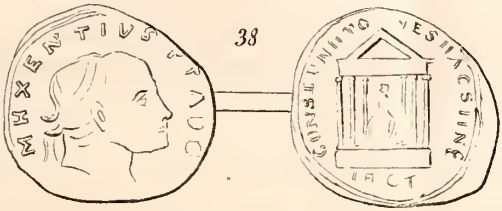
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Fig. 38. A. D. 309. } MAXENTIVS PF AUG. Head much worn.

Reverse. CONSERVATORES VRBIS SVAE, beneath IACT.

Type. A statue of *Roma*, seated in a temple of 6 columns.

Weight 105 grs.—the *half follis* described in *Band.* II. 154.

Fig. 39. A. D. 307, 312 } CONSTANTINUS MAX AUG. Head with a wreath of jewels.

..... EXERCITUS *(gloria exercitus).*

Type. Two military standards with armed supporters; some letters below illegible.

Fig. 40. A. D. 302. } CONSTANTINUS AUG. Head of the Emperor.

Reverse. PROVIDENTIÆ AUGG. Below SMANTE.

Type. A gate or arch *(castrorum porta*, Band. 278) surmounted by two globes, and a star in the centre.

Ditto.—Another coin of similar inscription and type. Head laurelled.

Ditto.—CONSTANTINVS MAX AUG.

GLORIÆ X EXERCITVS. Military standard. SMANS.

This coin is reckoned rare by Bandurius, as it bears the Monogram of Christ.

Fig. 41. A. D. 335. } CONSTANTINVS AVG. Head with plain band.

Reverse. DN CONSTANTINI MAX AUG. Below SMNA. *Med.* 468.

Type. A wreath enclosing VOT XXX.

Weight 60 grs.

This coin must be a *denarius æris*, coined previous to the introduction of the large copper follis of 240 grs.

Fig. 42. A. D. 330. } CONSTANTINOPOLIS. A juvenile head (of Constantine junior?)

Reverse. Legend wanting: Victory with outspread wings sitting on the prow of a ship, with spear and shield: below SMALR.

Weight 40 grs.

This piece differs in the epigraph from any enumerated in *Bandurius*: it is not certain whether *Constantine* himself struck any coins in honor of his new capital, or whether they originated with his successors. A. D. 330 is the date of the dedication of the new city.

A. D. 330.—VRBS ROMA. Juvenile head helmeted.

Reverse. Romulus and Remus suckled by a wolf: two stars above; below CONS⊙

Coins of the imperial city seem to have been struck at the same period with those of its rival Constantinople, to prevent jealousy between the two.

Fig. 43. A. D. 330. ...VL CONSTANTIVS NOB C. *Flavius Julius Constantius... Nobilis Cæsar.* Head with plain band.

Reverse. GLORIÆ EXERCITVS. Two standards and martial supporters: below..CP..

Weight 50 grs.

Constantius was made Cæsar by his father Constantine the Great, in 323.

A. D. 330.—FL IVL CONSTANT NOB C

GLORIÆ EXERCITVS. Below, CMB. Standards.

There are two or three coins of similar device.

It is difficult to say, whether the last two are coins of *Constantius*, or of his brother *Constans*: both having the same names FL. IVL. The coins of Constantine and his family are extremely numerous, and have nothing to mark their precise dates. Bandurius arranges them alphabetically, according to the legends on the reverse.

A. D. 337.—DN CONSTANTIVS PF AVG. Head with ornamental wreath.

Reverse. FEL TEMP REPAR.... Below illegible.

Type. A captive thrown from his horse, is pierced by the spear of a Roman soldier.

The device of this small coin is very neatly executed.

Fig 44. A. D. 364. DN VALENS P F AVG. Head with plain band.

Reverse. SECVRITAS REIPVBLICÆ indistinct. Victory stepping forward: on the face SP; below ASISCL.

This coin is described by Mediobarbus, 506. Valens was put in charge of the western empire by his brother Valentinianus in the year 364.

Fig. 45. A. D. 393. ....DOSIVS PP..Head with star on the right.

Reverse. GLORIA ROMANORVM. Three figures standing, armed with spears. *Med.* 519.

Mediobarbus supposes the three figures to be the Emperor *Theodosius*, with *Arcadius* and *Honorius*, his sons, imploring the divine aid on their expedition to Italy: the coin is rare; it was found at *Mahabalipûram*, along with several others, bearing the same device, but of a smaller size. They belonged to Col. Mackenzie's cabinet.

Weight 30 grs.; the οβολον.

Fig. 46. A. D. 379,395 THEO....Head of the Emperor Theodosius much worn.

Reverse. Illegible. Victory crowning the Emperor.

Fig. 47. A. D. 403. .....VS PF AVG. Head of Arcadius?

VIRTVS.....The Prince receiving a crown of laurel from Victory.

ROMAN COINS PL. IV.

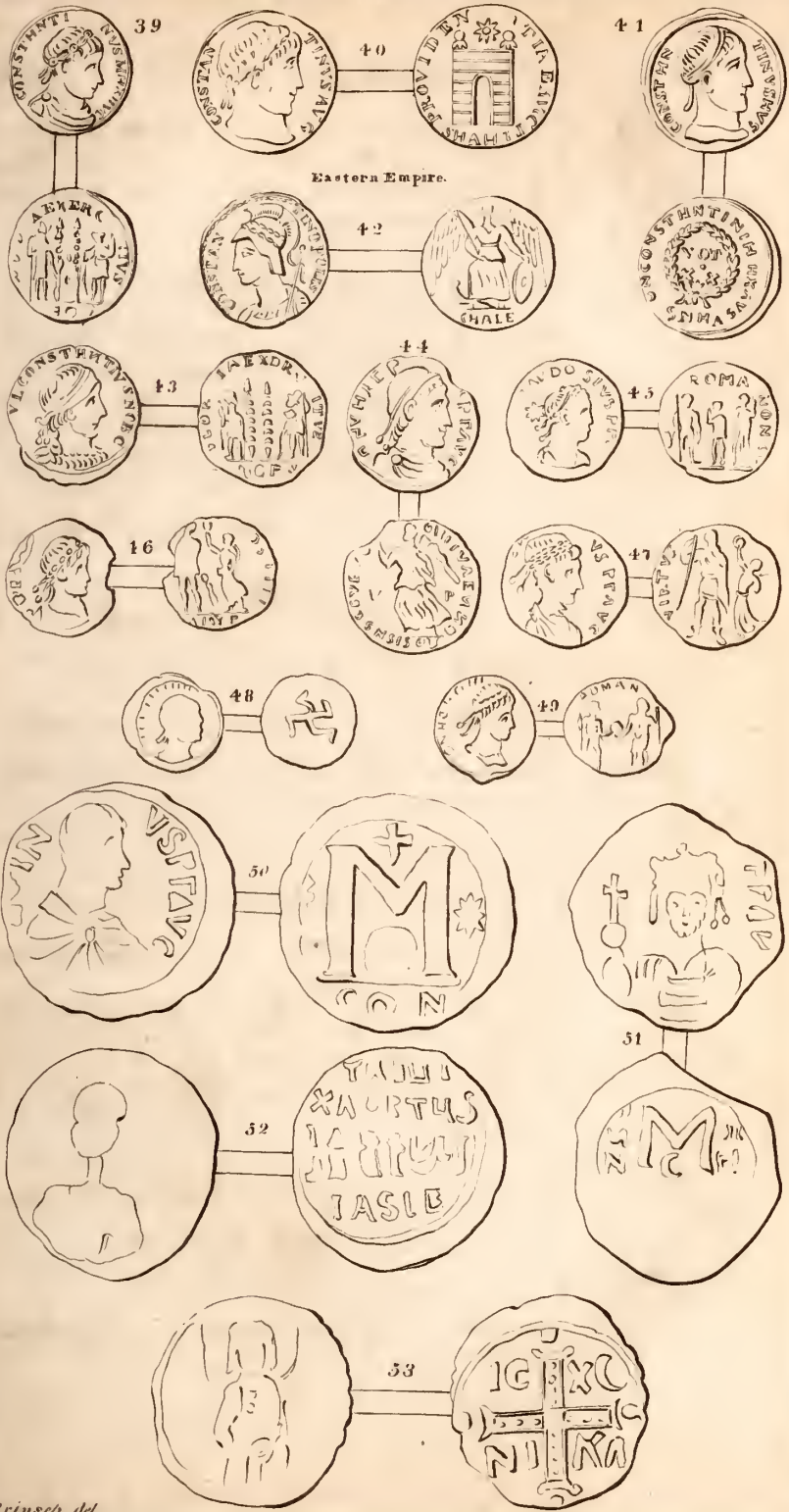

Fig. 49. A. D. 394. } DN HONORI...*D. N. Honorius Aug.*

....ROMAN...*Gloriæ Romanorum.* Two figures armed, supporting a globe.

Weight 20 grs. the *νουμιον*.

This device, no doubt, represents the two brothers, but the type is not found in either of our authorities. A coin of *duæ figuræ*, is mentioned in Patin's catalogue of rare inferior coins.

Fig. 48.—A small coin referrible to the same period, but unintelligible. On the reverse four legs united, or a cross? From their weight these must be the *νουμια*, or smallest copper coins, whence the denominations of those which follow were derived, as explained in the introductory remarks.

Fig. 50. A. D. 522. } ....INVS PF AVG Probably *D. N. Justinus Pius Felix Augustus.*

Reverse. * M * with a globe under the centre of the M. Copper CON *follis*, of very inferior fabrication.

Weight 170 grains.

Fig. 51. A. D. 585. } ....PF AVG. Front face apparently of *Mauricius*, with jewelled head-dress: holding in his left hand a globe and cross.

Reverse. A N N O M II C II The year is not very distinct; c under the M does not occur in *Med.* 576, or *Band.* 666. The *follis.*

Weight 240 grains.

Fig. 52. A. D. 970. } Head apparently of Christ, almost obliterated; inscription on the reverse, very rude and only partly legible...XRISTuS ... BAsIL ..

This is a coin of *Joannes Zimisces* (*Band.* 738), the full inscription being IηSuS XRISTuS bASILευS bASILEων.

Weight 140 grains.

Fig. 53. A. D. 970. } Three-quarter front figure of Christ, with a glory round the head: much worn.

Reverse. An ornamental cross, with four globes in the quarters IC XC NI KA signifying Ιησω Χριστω νικα, which may be the origin of the Latin motto, *In hoc signo vinces.*

Weight 170 grs.

Joannes Zimisces, a monk who rose to the throne after the murder of his benefactor Nicephorus Foca, was the first who ventured with dissimulated piety to put the effigy of Christ upon his coin. They were thence called Σωτηρικοι. The modern Greeks erroneously ascribe them to Constantine the Great. It is a curious fact, that these, which are the most recent coins in the cabinet of the Asiatic Society, should be in the worst state of preservation.

Note.—Since writing the above, the Society has become possessed of 250 Roman coins, purchased from an Armenian; as they were not found on the continent of India itself, I do not feel called upon to include them in the present list, although they will be of great use in forming the germs of a future cabinet. Some of them are in high preservation; they comprise

2 of Augustus	2 Maximinus	32 Diocletianus
2 Nero	1 Septimius Severus	27 Maximianus
1 Galba	1 Sept. Geta	18 Constantinus
6 Vespasianus	4 Alexander Pius	2 Constantinopolis
1 Titus	1 Gordianus	11 Constantius
3 Domitianus	8 Philippus	2 Valens
2 Nerva	6 Trajanus Decius	2 of Greek Towns
2 Trajanus	8 Gallienus	1 Severa
6 Hadrianus	4 Claudius Gothicus	1 Lucilla Augusta
45 Antoninus Pius	2 Aurelianus	4 Faustina
16 Commodus Ant.	8 Probus	2 Mammæa

and 20 others, more or less illegible. Should any of them turn out to be new or rare, I shall take occasion to notice them hereafter.

III.—*Observations of the Transit of Mercury.* *By* James Prinsep, *Sec. Phys. Cl.*

On the 5th of May, the expected transit of Mercury over the sun's disc, a phenomenon which occurs twice in an interval of about 12 years, invited all lovers of astronomy to be prepared at their telescopes. Unfortunately, in Calcutta, the day proved cloudy just at the time when the ingress took place, and, as the sun set before the egress, little advantage could be taken of the event in correcting the longitude; much less in attempting to furnish data for the calculation of the parallax of the sun or of the planet. From half past four to a quarter past five P. M., there were intervals of sunshine sufficient to afford a transient view. Lieutenants Waugh and Rennie, Engineers, endeavoured with me to profit by these moments in taking the position of the planet on the sun's disc. We were permitted the use of a

very fine 4-feet achromatic telescope, belonging to Lieut. Pemberton, of four inches aperture, mounted equatorially, and provided with a delicate wire micrometer. The power used was 60, and the darkened glass was varied to accommodate the light to the eye—the clouds were sometimes sufficient alone to act as a screen against the sun's rays.

For the time we were indebted to Mr. Gray, with whose astronomical clock our chronometer was compared before and after the observation; thus,

At 9 h. 10 m. A. M,		*m.*	*s.*
Chronometer slow of Ellicott's Clock,	—	15	46.2
Deduct error of Clock by Me. So. Time,	+	4	55.2
Chron. slow of Mean Time,		10	51.0

	m.	*s.*		
At 5 h. 45 m. P. M. Chron. slow,	15	50.0		
Clock fast, (daily rate 0.2 gaining),	+ 4	55.2		
			10	54.8
Chron.'s loss in 8 h. 35 m.				3.8
Daily rate losing,				10.33

Hourly rate 0.43 s.

Correcting the times noted, therefore, the subjoined are the observations expressed in mean solar time. From the rapid motion of the sun, we found it quite impossible to measure the distance of Mercury from either the advancing or the following limb with the wire micrometer; the planet's distance, however, from the tangent of the sun's northern limb, or at right angles to his motion, was taken at three different times, during the series of observations. There is, however, more or less uncertainty in this mode of measurement, from the difficulty of bringing one of the wires of the micrometer to coincide with the sun's limb, as from the darkened eye-glass, the wire ceases to be visible as soon as it is off the disc; the divided object glass micrometer is in this respect preferable.

For the equatorial measurements, we had resort to the times of transit of the sun's two limbs and of the planet past the two wires of the micrometer; repeating the sights as frequently as the weather would permit, by moving the telescope a little in advance before each series of readings commenced. There was a small spot on the sun indistinctly defined towards the advancing limb, the transits of which were also noted: the time occupied by the planet's passage of a wire was about half a second, but as small reliance could be placed on the measurement of such a space, it has been preferred to insert the mean of the two readings, as the passage of his centre. His disc appeared as a

clean circular spot, surrounded with a slightly enlightened ring; his diameter was as near as could be estimated, that of one of the micrometer wires.

The time occupied by the passage of the sun's disc across the wires decreased as the evening advanced, from the effect of the atmospheric refraction contracting his vertical diameter.

Transits of Mercury and of the limbs of the Sun, past the wires of an equatorial telescope in mean Solar Time, at Calcutta, Lat. 22° 36′ 21″ Long. 5h. 53m. 28s.

Number of the series.	Passage of ☉'s advancing limb.	Passage of Spot on the sun.	Passage of ☿'s centre.	Passage of ☉'s following limb.	Time of ☉'s diameter passing the wires.	Interval from ☿ to ☉'s second limb.
	H. M. S.	M. S.	M. S.	M. S.	M. S.	
1	4 30 44.3		31 59.5	32 57.6	2 13.3	0 58.1
2	33 54.4	34 10.3	35 09.0	36 07.8	2 13.4	2 58.8
3	46 40.8	46 57.2	47 51.3	48 54 2	2 13.4	1 02.9
	47 04.9	47 21.6	48 17.0	49 18.6	2 13.7	1 01.6
4	49 40.6	49 56.4	50 50.4	51 52.6	2 12.0	1 02.2
	50 05.3	50 20.6	51 15.2	52 17.6	2 12.3	1 02.4
5	52 36.5	52 52.5	53 45.5	54 48.3	2 11.8	1 02.8
	53 01.5	53 16.7	54 09.9	55 13.7	2 12.2	1 03.8
6	5 00 06.3	00 23.0	01 14.5	02 17.5	2 11.2	1 03.0
	00 33.7	00 49 3	01 40.5	02 45.6	2 11.9	1 05.1
7	03 38.0	03 54.3	04 44.7	05 50.3	2 12.3	1 05.6
	04 04.3	04 19.7	05 10.2	06 15.7	2 11.4	1 05.5
8	16 05.6		17 09.1	18 17.8	2 12.2	1 06.7
	16 33.8	16 59.4	17 36.6	18 45.8	2 12.0	1 09.2
Means.	4 54 37.7		4 55 46.6	4 56 50.0	2 12.4	1 03.4
Time of ☉'s passing meridian by Nautical Almanack,..					2 12.28	

Distance from Mercury's centre to the tangent of the northern limb of the sun, measured with a wire micrometer.

	Mean Solar Times.	Divisions of the Micrometer.	In space.
	h. m. s.		′ ″
At	4 40 00	509	5 55.4
	4 57 14	530	6 10.1
	5 07 24	568	6 36.6

The sun's horizontal diameter measured by the same micrometer, on the 7th May, 6 P. M. was 2727 divisions. By the Nautical Almanack for the same period, it was 1904.0 seconds, which makes the value of the divisions 1.432 per second.

There is too much discrepancy among the foregoing measurements to allow of their being individually useful; the utmost that can be expected from them is the determination of the position of Mercury on the sun's disc at one mean period. As I hope this will be

undertaken by an astronomical friend, who will combine the results here published with his own observations at Madras, I shall leave the subject in his more able hands.

I have been favored with the following observations of the transit at other places:

At the Surveyor General's Office, Calcutta.—The mean time of Mercury's outer contact was observed at 2 h. 53 m. 24. 2 s., but the sight was not esteemed good, owing to the state of the weather.

At Chuprah.—Latitude 25° 43′ N. Longitude 5h 39m. E. Mr. Walter Ewer observed the internal ingress of Mercury at 2 h. 42 m. 18 s. mean time. "The telescope was a Troughton's three and a half feet achromatic, aperture two and three quarter inch, and power about 60. The time was taken by equal altitudes of the sun on the preceding day. The nearest approach was at about 6 h. 8 m., taken with a wire micrometer by Troughton; but the sun was so low, the refraction so great, and the motion of Mercury so slow, that this can only be considered an approximation. The precise latitude and longitude of the place are not yet determined."

At Barelly.—Latitude 28° 20′ 7″ N. Longitude, 5 h. 17 m. 20 s. E. The internal ingress was observed by Mr. H. S. Boulderson, at 2 h. 20 m. 58s. mean time Barelly. "This observation may be doubtful to two or three seconds, as the planet had just entered the disc of the sun when first seen."

IV.—*On the Habits of the Paludinæ.* By Lieut. T. Hutton, 37th N. I.

If it be not against existing rules and regulations, and the matter here furnished be deemed at all worthy a place in your interesting Journal, I propose doing myself the pleasure of sending you occasionally a few extracts from my "Notes on Natural History," accompanied by specimens of any thing that I may consider worthy of your acceptance.

On the 21st and 22nd of June, after a few heavy showers of rain, I ventured forth from my bungalow to a grove of mangoe trees hard by, in search of land-shells, or in fact any thing that might fall in my way; at the foot of many of the trees, the water was lying in pools, and wherever this was the case, I found a great many small shells, with the living animals in them, evidently just forcing a passage

through the moistened earth, and crawling over its surface beneath the water in search of food. I gathered up several of them, and took them home, where they were placed in a tumbler for future examination.

In about an hour afterwards I returned to the same spot, in search of more, but by this time the water had all dried up, and with it had disappeared the shells also. From that time up to the 1st July, we had no more rain, and the weather became in consequence very sultry and oppressive; the heat once more put to flight the various insects, &c. which were just preparing to sally forth, and although I was a daily visitor at the mangoe grove, I made no addition to my museum.

On the 1st, 2nd, and 3rd days of July, the rain descended in torrents, so much so, that the plain all round my bungalow, for some hundreds of yards, was a sheet of water for several hours after.

This state of things gave new vigor to my spirits, for I knew, that when the water should have sufficiently subsided to allow of my going out, a rich harvest awaited me: and I was not disappointed, for my usual haunt the clump of mangoe trees, alone, furnished me with a good supply, not only of the above-mentioned shells, but also with two fine specimens of the wood scorpion and a fresh-water crab.

With regard to the shells, I perceive that in the 9th No. of the Gleanings in Science, Mr. Benson has made some observations on a small species of *Paludina*, found by him in localities somewhat similar to those observed by me; but as that gentleman seems uncertain of their abode and habits during the hot season, I shall here mention a few observations which I made on finding shells in the situation above described. At the roots of several trees, the water was lying in puddles, and thinking that this might have been occasioned by the droppings from the tree, I stooped down to see if there were any insects or land snails washed down with it, and I there saw, for the first time, the little *Paludinæ* crawling on the dead leaves, &c. beneath the surface of the water; several of these I took home and placed in a tumbler without any water, where they remained forgotten for a week or more, but on looking at them at the end of that time, they were all firmly closed and shut in by their little calcareous *opercula;* on putting them into water, however, they began to open and crawl about in apparently good health.

On an after-occasion I had the good fortune to observe them pushing aside the moistened earth, and coming forth from their retreats; but on the disappearance of the pools of water, not one of them was to be seen above ground; wishing therefore to ascertain what had become

of them, I turned up the earth at the base of several trees, and invariably found the shells buried from an inch to two inches below the surface.

From this circumstance, I am strongly inclined to think, that during the prevalence of the hot-weather they remain beneath the surface of the earth in a state of torpor, at a sufficient depth to protect them from too great a degree of heat, and the immediate action of the sun upon them, until the refreshing moisture of the rains once more enables and induces them to come forth for the purpose of performing that part, in the great chain of animated nature, for which an all-wise Creator destined them.

Of these shells I have found two species, both in the same situations, and both having calcareous *opercula*.

The largest of the two appears to be identical with that found by Mr. Benson in a ditch at Banda, and the animals of both are similar to those of the other *Paludinæ*.

No. 1. Animal with the head proboscidiform; two *tentacula* long, tapering, and retractile; eyes at the exterior base of the *tentacula*; color of the animal pale, with a dirty tinge of white; head and *tentacula* mottled with greyish.

Shell. About 4½ lines long, with a pale olive-brown *epidermis*; whorls (apparently) 4; the spire very much eroded; aperture angular above *and below*; deeply umbilicated; *operculum* calcareous; shell conoid; whorls rounded.

No. 2. Animals similar to the foregoing; colour pale throughout, but darkest on the head.

Shell. About 4 lines long, with an olive-brown *epidermis*: whorls 4; spire eroded; aperture sub-ovate, angular above, rounded below; no *umbilicus*; *operculum* calcareous, and at the very edge of the shell, and incapable of being drawn within the aperture; shell conoid; whorls rounded.

In Lamarck's generic description of *Paludina*, he merely says, when speaking of the aperture, "*angular at the summit.*" If by this we are to understand, that it is *only* angular at *the summit*, and *not below*, then my species No. 1 is no longer a *Paludina*, being angular *both above* and *below*; it therefore remains to determine to what genus it is referrible, or whether it may not constitute a new one.

At all events, I am inclined to think, it cannot be classed with the *Paludinæ*, as all the shells of that genus in my possession (and I have six or seven species) are angular at the summit alone, agreeing with the generic description.

The circumstance of these shells burying themselves beneath the surface of the earth is by no means peculiar to them; both the *Ampullariæ*, *Planorbes*, and *Paludinæ*, being found in similar situations during the heats of the dry season, as I should suppose Mr. Benson must have observed;—of this I have abundant proof before me in a hollow, which being now full of water, forms a tolerably large jhíl, in which all these species occur plentifully; but a fortnight or three weeks ago this same hollow was as hard and dry as the walls of my bungalow, and yet by digging a very little way below the surface, I found both *Ampullariæ* and *Paludinæ**, which on being left in a tub of water for about a quarter of an hour, began to crawl about in great vigor.—At the bottom of the tub I placed a quantity of mud, about nine inches or a foot deep, and when after some days, the water by not being renewed, had all evaporated, the shells of both genera had disappeared, and were buried in the mud at the bottom. I allowed them to remain thus for a few days, until the mud became dry, and I could not disengage them from it, without digging them out, whem I again furnished them with water, which by moistening the earth enabled them to force a passage through it.

The ova of *Ampullariæ* occur very abundantly at this season, in the small jhíl near my house, being deposited in beautiful clusters among the long grass and weeds just above the water mark; in some instances, I saw the animals in the act of depositing them. At first they are rather soft, and contain a gelatinous transparent substance, like the white of an egg, but thicker; in a few hours, they become brittle and covered with a calcareous shell, of a pure white. When fresh and moist, they are very heavy, but become remarkably light on drying. In shape they are sometimes round, sometimes oval, and resemble small caraway comfits stuck together in bunches.

If my present communication be deemed acceptable, I shall have pleasure in continuing from time to time to furnish you with a few lucubrations on similar subjects.

Mirzapore, 23rd July, 1832.

Note. We shall always be happy to receive Lieut. Hutton's communications, which are those of a zealous amateur in a field hitherto but little explored.

The doubt expressed by the author as to the first of his species may perhaps reasonably be extended to both, if the structure of the *operculum* be allowed to indicate the structure of the animal; and neither the one nor the other of these *Molluscæ* would belong to the genus *Paludina*.

* *Paludinæ* with corneous *operculum*, shell thin and pale-greenish; animal with the head and *tentacula* spotted, orange and black.

In this interesting paper, both species are described as having a *calcareous operculum*, but the under-mentioned authorities describe the *operculum* of *Paludina* as *horny*.

"Un opercule orbiculaire et *corné*"
"Operculum orbiculare *corneum*"

are the expressions of De la Marck, and which would have been noticed by Dubois if incorrect. Dubois however contents himself by translating them "the operculum *horny* and orbicular." Mr. Guilding, in his notices of the Zoology of the Caribæan Islands, when speaking of the "*Paludina Anetorum*," says, "operculum *corneum* in dorso pedis." And some species found in Bengal have none other than a horny *operculum*.

Again;—the author describes his first shell as "*deeply umbilicated*," and the second, with "*no umbilicus*." On this part of the subject Mr. Guilding represents the shell of the genus *Paludina* as "*sub-umbilicata*," a term well expressive of the rudimental *umbilicus* formed by a slight reflection of the columellar lip towards the body of the shell; De la Marck affords negative evidence by making no mention of any kind of *umbilicus*; and in this country it occurs but in the slight degree mentioned above. All concur in the rounding of the lower part of the aperture.

Upon the whole, therefore, these species do not appear entirely to agree with the characters of any known genera; but this is a point of too much importance to be determined in the absence of an exceedingly minute description, both of the animal and the shell, particularly of the anatomy of the former.

V.—*Proceedings of the Asiatic Society.*

Wednesday, 5th September, 1832.

The Rev. Dr. W. Carey, senior member, in the chair.

Read the Proceedings of the last Meeting, and proceeded to the ballot, when Sir Edward Ryan was elected President of the Society; and

Mr. J. Calder, Vice-President, in his room.

Dr. Langstaff, proposed at the last meeting, was elected a member.

Correspondence.

The Secretary communicated to the meeting an application from the executors of the will of the late Mr. Bruce, for the Society to forego their claim to any further share in the property of the testator in favor of his brother and sister.—*Resolved*, that the determination of the Society be suspended, until they are apprized of the amount of the residuary share to which they are entitled by the will.

The Secretary communicated to the meeting a letter from the Baron de Ferussac, with reports, prospectus, and proceedings of the Societé Anonyme of Paris, and proposing to the friends of Literature and Science in India to subscribe for six shares in this Society.—*Resolved*, that the letter and documents accompanying be referred to the Committee of Papers for their report at the next meeting of the Society.

The number of literary and scientific journals issued to the world in the nineteenth century, amounts according to the prospectus of the Bulletin to upwards of fifteen hundred; learned Societies have multiplied in an equal ratio; so that it would occupy a man's life to peruse the mass of information accumulated, even if he could collect together the numerous works containing it. The Baron de Ferussac would secure to France the privilcge of assembling and concentrating in a focus this scattered knowledge: he is perhaps the only man ambitious, persevering, and laborious enough to put the feasibility of such a scheme to the proof; but the experience of eight years has shewn that he is equal to the task. His Monthly Bulletin Universel, in its eight parts, contains analyses of the contents of every published journal, and with the aid of copious annual indexes, forms a register of all that is done in literature and science, enabling the student of any department to become acquainted with every new fact and discovery, and the historian to trace the progress of each science, from a most perfect and compendious record.

But the scale of the work as hitherto conducted is found to be quite inadequate to embrace the mass of additional matter now offering itself for publication:—and the only mode of effectually keeping pace with the demands of knowledge, is to enlarge the scheme by raising further capital, or forming a kind of joint stock association among those who would otherwise patronize the work as subscribers; and of whom there are already 5000 enlisted.

The following is a general view of the scheme:

There are 500 shares, 450 regular and 50 supernumerary, valued at 1000 francs each: a share may be held jointly by any number of persons not exceeding four.

The holders will be entitled to such annual dividends as may be afforded by the profits of the concern.

The shares are to be transferable and heritable.

Every share-holder has the option of receiving the monthly numbers of the Bulletin to the value of 50 francs, per annum, per share, in lieu of a dividend to that extent, or any thing below it.

According to the prospectus published on the cover of our July No., 50 francs will cover the subscription to any single division of the work, except the geographical. The whole work of eight parts costs 300 francs per annum.

The Society to continue 25 years from the year 1828.

Of the 500 Shares, France has already subscribed for	150	
Original proprietors and coadjutors, ...	89	
		239
Foreign countries, ...		51
		290

There are still 210 shares to be disposed of, and these have been assigned by the projector to the various literary bodies, who have not yet joined the association; thus six shares have been set aside for the members of the Societies at the several British establishments in India, and one share for the Governor General: the originator of the scheme calculates more on the moral support and concurrence of its friends, than on their expectation of pecuniary benefit; and certainly viewing it as a money transaction, unless some prospect is confidently held out of much higher annual dividends than 5 per cent., it is not clear wherein the advantage of investing capital in the concern would lie: the interest of the same sum, safely lodged in the securities of the country, would purchase an equal portion of the

publications of the Societé Anonyme: and a subscription for the whole work would be equivalent to the interest of the six shares.

The Treasurer's Report submitted, showing a balance in favor of the Society of Rs. 10,892, 6. 7.

The Collector's Report submitted, shewing a balance of outstanding bills of 11,140, of which 3,856 may be realized.—*Resolved,* that the Subscribers in arrear be written to for payment.

Museum.

A number of articles of Tibetan manufacture, presented by Government.

A collection of shells and a dried fish, presented by Dr. Burlini.

A snake, called *Kaulau Ganney,* presented by Mr. George.

A metal box, containing eleven silver rings, and three coins, (two of the Mohammedan Kings of Bengal, and one of Assam,) dug up in clearing an estate in the Sunderbans, sent for inspection by Mr. Storm.

Fourteen specimens of Roman coins, procured in Persia, presented by Mr. Avdall.

Library.

Books from the Bookseller, laid on the table.

Rickard's India, Part 4th.

Gray's Indian Zoology, Part 8th.

Lyell's Principles of Geology, 2nd Vol.

Cabinet Cyclopedia,—Military Commanders; Italian Republics; and Porcelain and Glass.

Mr. H. T. Prinsep presented Molesworth's Mahratta Dictionary on the part of the Bombay Government.

Read a letter from Mr. Twining, presenting a copy of his Clinical Illustrations of the Diseases of Bengal.

Read a letter from J. Vaughan, Esq. Secretary of the Philadelphian Philosophical Society, dated 29th April, 1830, presenting,

1. Mr. C. L. Bonaparte's Observations on the Nomenclature of Wilson's Ornithology.
2. Danas' Outlines of the Mineralogy and Geology of Boston and its vicinity.
3. Secretary of Treasury's Report to Congress on the Commerce and Navigation of the United States for 1830.
4. Achlan's Flora Cantabrigiensis.
5. Vols. 4 and 6, and 1st New Series of the Transactions Americ. Phil. Soc.

And offering politely to supply any former numbers of the Transactions which may not have reached the Society.

Dr. Bowdich's Translation of the Mecanique Celeste,—*presented by the author.*

Meteorological Registers for May, June, and July, 1832,—*from the Surveyor General.*

A list of books, some of which it might be desirable to purchase, submitted by Mr. J. Tytler. Referred to the Committee of Papers.

Resolved, that the thanks of the Society be presented to the Donors of the above presents.

Literary.

A collection of papers on the language and literature of Madagascar, and specimens of Missionary Tracts, printed at Madagascar, were presented by Mr. Calder, on the part of Mr. C. Telfair, President of the Natural History Society of the Mauritius.

We hope hereafter to find room for the insertion of some of the curious legends of Madagascar, as translated faithfully by Mr. Baker, the contributor of the specimen of the poetry of that island printed in our number for March.

Remarks on the intercourse of the western nations of antiquity with India, by Mr. E. Stirling.

The papers connected with the abstract of the subsequent portion of the Kah-gyur were laid on the table; of which an analysis by the Secretary was presented at the last meeting; (printed in the present No.)

The thanks of the Society were voted for the above.

VI.—Miscellaneous Intelligence.

1.—*Extract of a letter from Lieut. Alex. Burnes, dated Balkh, 11th June,* 1832.

"On leaving India, I had resolved to avoid the Town of Khúlm, in the territories of the Uzbek chief of Kúndúz, who placed Mr. Moorcroft's party under contribution to the amount of 25,000 rupees, but by the urgent advice of a most influential man at Kabúl we joined a party who were to pass that town, since they were supposed to have influence at Kúndúz. The result was, that we were forthwith put under surveillance, and reported to the chief, who summoned us to his presence. Leaving all my party behind me, as well as Dr. Gerard, I proceeded to Kúndúz, and personified the character of a poor Armenian, by profession a watchmaker, who was proceeding to Bokhara. Múrad Bég was deceived; but I must add, that I first came to a private understanding with his custom-house officers to keep me in countenance. You may imagine, I did not wait long at Kúndúz, but mounting my horse, rode 70 miles at one stretch, and 40 on the following day, to this city, where we are beyond the reach of all such désagrèmens. As I finish this, our caravan is just starting for Bokhara, which we shall reach in fourteen days.

Our journey across the Hindú Kúsh was most exciting: it is a fearful undertaking, but with a judicious choice of seasou presents no barrier to the passage of an army, if accompanied by a *horde* of pioneers. The great range of the Indian Caucasus, i. e. the prolongation of the Himalaya, has been placed erroneously in our maps to the north, instead of the south of Bamían. None of the passes were higher than 12,000 feet, as water boiled on them at 192° and 193°, [Bar. 19.72 and 20.15 inches,] but some of the peaks cannot be under 20,000 feet. There are six passes between Kabúl and Khúlm. The formations of the three first differed widely from those farther north, and which are lower. South of Bamían we had iron, blue mica slate, and quartz, and from the higher hills blocks of granite had been precipitated from above. North of Bamían, at the pass of *Dundan Shikun,* or the tooth-breaker, the formation changed into ash-coloured limestone, and continued so till we left the mountains. Once across the mountains we wound among terrific defiles and dells, the different courses of the water. Some of these rose to a height

of 2000 perpendicular feet over our heads, and were such as to hide the sun from our view. What a country for a geologist! The Hindú Kúsh is almost destitute of vegetation; but the asafœtida plant grows in great exuberance, and forms the principal pasture of the flocks, which browse over them.

We have now fairly debouched into the plains of Tartary, but we have no plateau or elevated land, as seems to have been imagined by some geographers to exist in these regions. Here water boils at $209\frac{1}{2}°$=[Bar. 28.40 inches], and before we reach Peshawer, since we follow the Oxus, it must even rise. This climate is considered insalubrious, but it looks a very nice place, and produces the most delicious fruit: the apricots are as large as small apples, with the mellowest flavour.

You must not suppose, that we took the route of the Hindú Cúsh in our journey to this place, but followed the grand caravanseras. The Hindú Cúsh is but the name of one pass over these mountains, and though it is the highest of all the practicable passes and is only traversable for three months in the year, it is described as the best road. Twenty horsemen may go abreast on it, but the snow is eternal, and it is a three days journey without grass, wood, or supply. It must be very high, since men and animals all experience a difficulty of breathing. There appears to be a phenomenon of nature in this mountain, which deserves mention—I allude to snow-worms. They are described to be as large as a silk-worm before it begins its cocoon, and white and transparent; they die on being separated from the snow."

2.—*Lithontrity practised in Persia.*

The following notice of a method of breaking up a stone in the bladder is extracted from the *Khawás-ul-hejár*, an anonymous Persian translation of a treatise on the properties of minerals, composed in the Arabic language; the date of the work is not known, but it is accounted ancient. Were the spirit of the author to appear before the Académie at Paris, we know not whether it might not become a claimant for a share of the Monthyon prize of six thousand francs lately adjudged to M. Leroy, for his various lithontritic instruments. The passage occurs in describing the qualities of the diamond.

" One of its properties is to reduce urinary calculi to powder, and it is used in this way :—a diamond of the size of a grain is fastened firmly to a kind of probe of copper (ميل *mil*, an instrument used for applying collyrium) with mastich or lac, which probe is then brought in contact with the calculus and rubbed upon it until the stone is broken to pieces, when it is voided with the urine."

3.—*Extract from a letter from Major Burney, Resident in Ava, to Mr. Swinton, dated Rangoon, 24th August*, 1832.

" I lately discovered in the 21st volume of the Burmese History, that the Cholera is no new disease in this country. In the year 1706, it raged in the city of Ava, and destroyed a great many of the inhabitants. The Burmese History, in which I find this account, is said to have been compiled before the Talain conquest of Ava in 1751, and the copy of the work which I possess is marked as having been transcribed in the year 1790. These are the words in the original. " On Thurs-
" day, the 4th day of the waning moon of *Katshoun* (our April), in the Burmese
" year 1068 (A. D. 1706), past six o'clock in the evening, the whole of the golden
" city was seized with panic, and made a great uproar, shouting and beating with
" sticks. And from this month of *Katshoun* the whole city of Ava sufferred from
" purging and vomiting, and a great many persons died of the *Kúla-na*, or Kala
" sickness." The above is a literal translation of the passage. The Burmese still

call the Cholera *Kála-na*, which means sickness that comes occasionally. About four years ago this dreadful scourge appeared in this town of Rangoon and carried off 3,500 of its inhabitants.

4.—*Rain at Chirra Púnjí, registered by W. Cracroft, Esq.*

1832.	*inches.*		*inches.*		*inches.*
June 1 to 17	6.45	July 12	0.450	August 6	5.805
18	2.24	13	1.150	7	0.937
19	1.40	14	1.420	8	0.680
20	4.91	15	5.169	9	1.987
21	4.76	16	7.597	10	1.155
22	1.04	17	5.250	11	0.517
23	not meas.	18	5.860	12	0.0
24	1.04	19	3.390	13	0.0
25	2.39	20	0.701	14	0.060
26	2.22	21	not meas.	15	0.915
27	0.0	22	do.	16	1.150
28	0.0	23	2.490	17	0.407
29	1.85	24	not meas.	18	0.765
30	1.40	25	4.869	19	0.0
July 1	1.95	26	0.0	20	7.812
2	1.83	27	0.0	21	2.862
3	2.12	28	1.350	22	4.420
4	4.57	29	1.355	23	1.595
5	9.73	30	0.0	24	2.425
6	4.11	31	2.642	25	not meas.
7	1.33	August 1	not meas.	26	1.087
8	1.837	2	2.715	27	2.650
9	1.247	3	2.862	28	2.170
10	0.0	4	2.690	29	2.050
11	1.287	5	not meas.	30	0.405
				31	2.265

For 16 days of June,	28.58 inches.
In July,	73.724
In Aug.	52.386
Total rain	154.690

For the first 22 days, the measurements were taken by means of a glass bottle and funnel:—afterwards, by an accurately constructed tin pluviameter.

5.—*Method of ascertaining the Humidity of the Soil, from an Arabic work,—communicated by* Mulví Abdúl Mújid.

"I find in a book of Agriculture, that if any one wish to know the proximity or distance of water, he is to dig three or four cubits in the earth, then to take a pot of brass, or a pitcher of earth, and besmear the inside evenly with fat; let the pot have a wide mouth, and when the sun sets, let him take a quantity of white wool, combed and washed, and a stone of the size of an egg; wrap this wool round it like a ball, and moistening the side of the ball with melted wax, attach it to the bottom of the pot already smeared with grease, then throw it to the bottom of the hole that has been dug, *so that the wool will be dependent, and the wax will retain it, and it will be dependent to the place of the stone**: then pile upon

* This passage is unintelligible in the original: it means apparently that the pot shall be placed in an inverted position in the well, so that the stone enclosed in the cotton and attached to the bottom of the earthen vessel with wax, shall hang in an insulated position in the hollow space; any moisture rising from the ground would thus be deposited in minute drops upon the cotton.

it earth to the height of one or two cubits, and leave it during the whole night, and when it is morning, before the rising of the sun, scrape the earth from it, and lift up the vessel, and if the water is seen adhering to the vessel within, in many drops, near to each other, and the wool filled (with it), there is water in this place, and it is near; and if the drops be not collected (together), and not near each other, and the quantity of water in the wool be moderate, then the water is neither very far off nor very near; and if the drops be adherent and separated from each other, and there be little water in the wool, then the water is distant; and if there be seen no drops in the vessel, neither large nor small, and there be no water in the wool, then there is no water in the place, and it is useless to dig it. I find also in some copies of agricultural works upon this subject, that he who wishes to know this matter is to examine the ants' nests, and if he find the ants thick, black, and slow in their motions, let him consider, and as slow as are their motions, so near is water to them, and if the ants are quick in their motions, it is not near; and the water is 40 cubits from them; and the water in the first case is sweet and good, and in the second is heavy and salt: and this paragraph is for him who desires to find water, and we have explained this in detail in our book the *Akhbar-uzzamán*, and have only mentioned here what necessity requires as a hint on the subject, without any detail or explanation." T.

6. *Mirage in India.*

It is not generally known that the mirage, appareutly first brought to the notice of modern Europeans by the French army in Egypt, is visible in the central parts of Hindústan. In Rajpútana it is necessarily of constant occurrence; but in the less arid plains to the eastward it is also to be seen. At Ghazípúr, between the European bazar and the stables of the Company's stud, there is a level, extending about a mile; from the east end of which may very often be seen, about half a degree under the western horizon, the appearance of a sheet of water about 1° in width and perbaps 10° in length from right to left, in which the sky, houses, trees, and animals are reflected as in a bright mirror. D. B.

7. *Hará Miná, or Green Basalt, used for coloring Stucco.*

The rock in which the caves of Ellora are excavated is stated by Captain Twemlow, Bombay Artillery, to be a basaltic trap, which from its green tinge, and its different stages from hardness to disintegration, is supposed by the natives to be full of *vegetable* matter in a greater or less advance to petrifaction. The crumbling rock affords a natural green color, which is ground up and employed by the natives in painting on wet chunam: it is called *hará miná*, or green enamel, probably because when exposed to heat it fuses into a dark bottle-green glass.

Chaptal, the chemist, introduced in France a method of making glass bottles with pulverulent basalt, either alone or mixed with sand and ashes. The above substance might doubtless be employed for the purpose, were there sufficient inducement to set up an establishment of the kind.

8. *On the Converging Beams of Light which are occasionally seen opposite to the Sun.*

"This phenomenon is always seen opposite to the sun and generally at the same time with the phenomenon of diverging beams, as if another sun, diametrically opposite to the real one, were below the horizon, and throwing out his divergent beams." In a phenomenon of this kind which I saw in 1824, the eastern portion of the horizon where it appeared was occupied with a black cloud, which seems to be necessary as a ground for rendering visible such feeble radiations.

"This phenomenon is entirely one of perspective. Let us suppose beams inclined to one another like the meridians of a globe to diverge from the sun, as these meridians diverge from the north pole of the globe, and let us suppose that planes pass through all these meridians, and through the line joining the observer and the sun, or their common intersection. An eye, therefore, placed in that line, or in the common intersection of all the fifteen planes, will see the fifteen beams converging to a point opposite to the sun, just as an eye in the axis of a globe would see all the fifteen meridians of the globe converge to its south pole."

Having observed in Sir David Brewster's treatise on optics (published last year in Lardner's Cyclopædia), the above repetition of his usual account of a beautiful appearance which frequently adorns our Indian evenings, and having always thought his explanation of it deficient in the clearness and truth which generally characterize his writings, I shall venture to suggest another mode of illustration:

The diverging beams which to us appear to *radiate* from the sun when obscured by broken masses of cloud are in fact, as a consequence of the sun's enormous distance, sensibly *parallel* to each other. It need hardly be remarked that in permeating the atmosphere they do not proceed in straight lines, but are more or less inflected towards the earth. This inflection being disregarded, they may be considered as a series of elongated parallel prisms, extending perhaps 50° to the north and south of the zenith, at the height of a few thousand feet. The beam which crosses the zenith will have to the spectator the same appearance as the sky seen from the centre of a long narrow street of lofty houses: at the zenith it will have its greatest breadth, and it will taper and appear to *descend* towards the sun and opposite point of the heavens, and the same will happen with all the other beams lying north and south of it; whence they will appear to *converge*.

I may remark, that the phenomenon is incomparably more vivid in this climate than in Britain, that it is frequently and most clearly seen when there is not a visible cloud except the few masses in the west which produce the necessary obstruction of the solar rays, and that the beams can be traced across the whole concave in alternate shades of the purest light and dark blue. D. B.

9. *Errors in Dr. Arnott's Physics, Second Volume.*

In the first volume of the GLEANINGS IN SCIENCE I remarked on some mistakes which disfigure Dr. Arnott's excellent Elements of Physics; and the first part of the second volume of the latter work having recently reached me, I would beg to direct the author's attention to the following slight blemishes, which might, if uncorrected, affect its otherwise well sustained character:

The most serious mistake is in his theory of the camera lucida, at p. 304: the eye does *not* see the paper "*through*" the prism but *beyond its edge*, the plane in which lie the line of sight and the edge of the prism bisecting the pupil.

At p. 218 he states that if the insertion of the optic nerves were at *corresponding parts* of the eyes, a black spot would always be seen in the field of vision;—forgetting that when only one eye is open *no* black spot appears. *Why* no black spot in this case appears is as yet unexplained.

At p. 194 he represents as a *straight* line a ray of light passing *obliquely* through the centre of a lens.

At p. 157 he states that "the inhabitants of India, where the thermometer sometimes stands at 115° in the shade, have their blood no higher than 98°." Dr. John Davy from numerous experiments concluded, that blood heat in tropical countries is raised to 100° during the hot season.

At p. 102 he repeats his erroneous theory of the artificial formation of ice in India,—" by evaporation and a current of air;" while the former circumstance is unnecessary to the process, and the latter always fatal to it. Radiation is the principle. D. B.

10. *Silver Mines discovered in Cuba. By* Don Ramon de la Sagra, *Superintendent of the Botanic Garden at the Havannah.*

(From the " Anales de Ciencias, Agricultura, Comercia o Artes" of May, 1828.)

When towards the end of 1826, I began a course of lectures on mineralogy and geology, it was my object to induce attention to the mineral productions of the Island of Cuba, and they had the effect of procuring me numerous contributions of specimens from various districts. About the same time Don Jose de Escalante, an inhabitant of Villa Clara, being well acquainted with the mines of Peru and Mexico, employed himself in exploring and examining the minerals of that neighbourhood, and he succeeded in discovering, first, several veins of copper, and afterwards a mine of silver, which he has claimed (denunciado) in the usual form. The specimens of minerals submitted by him, were sent to me for analysis by His Excellency the Intendent; and the following is the result; the silver being separated by amalgamation.

Iron,	67.84
Silver,	0.48
Silex and Alumina,	9.7
Loss in gases and water,	21.98
	100

The mineral is found in mass; of an earthy ferruginous appearance; friable on the surface, but compact within; of a grey metallic colour; texture granular, sometimes laminous; fracture irregular and rough, with a few bright specks; fluate of lime makes no impression; but the ore is easily scratched by rock crystal; yields a reddish powder,—not magnetic: its specific gravity is 2.25; easily dissolved by nitric and hydrochloric acid; and also by weak sulphuric acid, which disengages much hydrogen gas. When dissolved, prussian-blue may be precipitated abundantly with hydroferrocyanate of potash. Infusible with the blowpipe, which converts the ore into black scoria. Hence I class the mineral among the ochreous iron-stone, or the *Ochriger roth Eisenstein*, of the Germans.

According to Geological reports of the mines in Peru, most of the silver from that country is extracted from ore of iron clay. In Mexico also, there are mines worked in the province of Oajaon the ore of which has a similar appearance, being composed of grey iron with native silver disseminated in the mass, not perceptible to the eye. Humboldt remarks, that, both in Mexico and in Peru the masses of oxide of iron which contain silver are found in the upper part of the veins near the surface of the earth; which is a good sign as regards Senor Escalante's discovery.

According to the report of the discoverer, the mine occupies a great extent of ground on the slope of a hill; but he is ignorant of the width and depth of the vein. A mine which yields 7½ ounces of silver to the quintal of ore, if the ore be abundant and of easy access and separation, is a treasure worthy the attention of government and of enterprising individuals. Should the mass of mineral prove as considerable as Senor Escalante asserts, the mine of Villa Clara will be one of the most valuable in America, on account of the proportion of metal which it contains, and the very simple process required to extract it.

The researches of Don Fausto del Elhuyar, whose fame is so well established in the history of science and of the mining art, shew that the mean produce of all the mines of Mexico does not exceed 18 to 25 parts of silver in 10,000, which is equal to 3 or 4 ounces per quintal (100 lbs.) The calculations of Senor Garrés give less than 2 ounces per quintal for the mean produce of all America. The great vein of Guanajuato, the most valuable in the world, has yielded only an average return of 4 ounces per quintal. The proportion of 7½ ounces found in the ore from Villa Clara is therefore remarkable; but not less so is the great facility with which I obtained the metal, by a first experiment, without any guide to regulate the quantity of salt and the proportion of quicksilver, best suited to form the amalgam, which nevertheless was formed within a few hours after throwing in the mercury. It is also to be observed that no "*magistral*" (precipitant?) was employed, which is usually indispensable.

A subsequent article by the same writer, dated January 1829, states that no other silver mine had been discovered, and that the working of that of Don Jose de Escalante had made little progress up to that date. G.

11. *Supposed Change of Climate of the Northern Parts of the Earth.*

Our readers are aware, that the opinion of the northern parts of our earth, having formerly possessed a much warmer climate than at present, has been adopted and supported by many naturalists and geologists. The proof of this fact is supposed to be found in the remains of vegetables and of animals, the inhabitants of warm countries, being now found in the rock formations of colder climates. Dr. Fleming, who was the first to shew the weak points of the much talked of speco-diluvian hypothesis of Dr. Buckland, has now taken up the subject of the remains of animals. His opinion is, that the discovery of the remains of a species in any rock formation is no ground for inferring, that the other species of that genus must have been also inhabitants of the same country. He considers, that unless *the same species* are found in our rocks, which at present inhabit warm countries, nothing certain can be concluded; as an instance how much analogy may mislead us in this question, he mentions, the genus *Equus*, the species of which are sufficiently separated in geographical distribution. In like manner he brings forward the elephant, the remains of which found in Siberia have been pronounced by Cuvier to be very probably those of an animal that inhabited a cold country. Analogy is certainly a powerful instrument in the search after truth, but it is to mistake its nature and use altogether, to apply it to the direct establishment of dogmas. It can only guide our enquiries; at most it may shed a ray of light upon our path, and enable us to distinguish and seize the particular truth we are in search of: but it would be to confound all science, to suppose that every analogy is a truth. Analogy cannot be made the foundation of a fact; but it may form sufficient grounds for enquiring if that fact be true or otherwise.

Dr. Fleming's paper is in answer to Mr. Conybeare, and taken with the former on Dr. Buckland's deluge, proves him to be an antagonist every way worthy of attention. Both the papers contain detections and refutations of that loose analogical inference, for reasoning it cannot be called, which is the bane of true science. H.

12. *Limestone Formation.*

Professor Sedgwick, in his communications to the Geological Society, of 1831, has shown, that the mountain limestone of the north of England consists essentially of

two groups, the " great scar limestone" is the lower, having an average thickness of more than 500 feet, and containing orthocerata, trilobites, and ammonites. The younger group contains five beds of limestone, of which the highest or " 12 fathom limestone" is associated with many strata of sandstone and shale, and 3 or 4 seams of workable coal. The whole of this calcareous system is overlaid by a complex group connected with the millstone grit, and interlaced with beds of shale, and one or two seams of coal. From his general conclusions we learn, that the carbonaceous formations become much more calcareous in their range to the north—that from the nature of the associated organic remains, coal has, in some places, been produced in deep seas, and in other places in shallow estuaries,—that changes in the mineral character of the contemporaneously formed strata are usually accompanied by changes in the species of the fossils, whether animal or vegetable—and lastly, that the valleys in the carboniferous chain, near the lines of section, are not fissures which have been deepened by erosion, but true valleys of denudation.

13. *Correction of a mistake in the notice on Marine Surveys.*

In page 333, line 4, where mentioning, that the sextant is used for taking the relative positions of points on shore, it was said that " the azimuth *compass* was resorted to only for laying down the true meridian." Every surveyor will see, that this must be an inaccuracy, as such determinations would ill accord with the exactitude obtained by the other parts of the operation. The sentence should have run thus ;—" azimuths taken with the sextant between the limb of the setting or rising sun and some fixed object on the horizon, as an island or peak, afforded the means of determining the true meridian." Such we know to be the method practised by Captain Ross.

VII.—*Progress of European Science.*

Mechanics.

1. *Steam Carriages.*

The introduction of steam carriages on the turnpike roads of England may now be considered as established : this grand improvement has broken its way through the difficulties opposed to it—in the nature of the machinery,—the varying resistances and levels of the roadway,--the prejudices of the public against its dangers and inconveniences, and the strenuous opposition of the stage-coach proprietors, and of the toll trustees, whose prohibitory increase of charge has been finally levelled by an Act of Parliament, if not passed, at least brought up by the chairman of the Select Committee appointed to inquire into the subject of steam carriages, and consequently not likely to be negatived.

This great achievement in mechanics has prevailed through two irresistible practical arguments : 1st, journeys from London to Bath and Southampton have been performed, and 2nd, a great saving of expence to travellers has been certified.

The following extract from the " Report" shews the progress already made :

" The first extensive trial of steam as an agent in draught on common roads, was that by Mr. Gurney, in 1829, who travelled from London to Bath and back in his steam carriage. He states, that although a part of the machinery, which brings

both the propelling wheels into action, when the full power of the engine is required, was broken at the outset, yet that on his return he performed the last 84 miles from Melksham to Crawford Bridge in 10 hours, including stoppages. Mr. GURNEY has given to the committee very full details of the form and power of his engine, which will he found in his evidence. The committee have also examined Messrs. SUMMERS and OGLE, Mr. HANCOCK and Mr. STONE, whose steam carriages have been in daily use for some months past on common roads. It is very satisfactory to find, that although the boilers of several engines described vary most materially in form, yet that each has been found fully to answer the expectation of its inventor; so well in fact have their experiments succeeded, that in each case, where the proprietors have ceased to use them, it has only been for the purpose of constructing more perfect carriages, in order to engage more extensively in the business.

When we consider that these trials have been made under the most unfavourable circumstances, at great expense, in total uncertainty, without any of those guides which experience has given to other branches of engineering,—that those engaged in making them are persons looking solely to their own interests, and not theorists, attempting the perfection of ingenious modes; when we find them convinced after long experience that they are now introducing such a mode of conveyance as shall tempt the public by its superior advantages from the use of the admirable lines of coaches which have been generally established, it surely cannot be contended that the introduction of steam carriages on common roads is merely an uncertain experiment unworthy of legislative attention.

Beside the carriages already described, Mr. GURNEY has been informed, that from twenty to forty others are being built by different persons, all of which have been occasioned by his decided journey in 1829.

The committee have great pleasure in calling the attention of the house to the evidence of Mr. FAREY. His opinions are the more valuable from his uniting, in so great a degree, scientific knowledge to a practical acquaintance with the subject under consideration. He states, that he "has no doubt whatever but that a steady perseverance in such trials will lead to the general adoption of steam carriages;" and again, "that what has been done proves to his satisfaction, the practicability of propelling stage coaches (by steam) on good common roads, in tolerably level parts of the country, without horses, at a speed of 8 or 10 miles per hour."

Much of course must remain to be done in improving their efficiency, yet Mr. GURNEY states that he has kept up steadily the rate of 12 miles per hour; that the "extreme rate at which he has run is between 20 and 30 miles an hour."

Mr. HANCOCK "reckons that with his carriage he could keep up a speed of 10 miles per hour without injury to the machine."

Mr. OGLE states, "that his experimental carriage went from London to Southampton in some places at a velocity of from 30 to 35 miles an hour.

"That they have ascended a hill, rising 1 in 6, at 16½ miles an hour, and four miles of the London road, at the rate of 24½ miles per hour, loaded with people.

"That his engine is capable of carrying three tons weight in addition to its own."

Mr. SUMMERS adds, "that they have travelled in the carriage at the rate of 15 miles per hour with 19 persons in the carriage up a hill 1 in 12.

"That he has continued for 4½ hours to travel at the rate of 30 miles per hour."

"That he has found no difficulty in travelling over the worst and most hilly roads."

Mr. JAMES STONE states, "that 36 persons have been carried in one steam carriage. That the engine drew 5 times its own weight, nearly at the rate of from 5 to 6 miles per hour, partly up an inclination."

The several witnesses have estimated the probable saving of expense to the public from the substitution of steam-power for that of horses at from one half to two-thirds. Mr. FAREY gives, as his opinion, "that steam coaches will very soon after their first establishment be run for one-third of the cost of the present stage coaches."

The advantages of steam-power are not confined to the greater velocity gained or to its greater cheapness than horse draught :—

"There is no danger of being run away with ; and that of being overturned is greatly diminished. It is difficult to control four such horses as can draw a heavy carriage ten miles an hour, in case they are frightened or choose to run away ; and for quick travelling they must be kept in that state of courage, that they are always inclined for running away, particularly down hills, and at sharp turns of the road. In steam, however, there is little corresponding danger, being perfectly controllable and capable of exerting its power in reverse in going down hills. Every witness examined has given the fullest evidence of the perfect control which the conductor has over the movement of the carriage. With the slightest exertion they can be stopped or turned, under circumstances where horses would be totally unmanageable."

The danger of explosion has been greatly reduced by adopting the tube form of boiler, and further benefit is expected from some ingenious modifications of Mr. TREVITHICK.

The questions of frightening the horses of other carriages, of inconvenience from smoke and steam, are also disposed of by the committee; but they are of too trivial a nature to need comment, and we know that steam carriages have passed over London bridge in the midst of vehicles of all denominations.

The mass of evidence taken before the committee is of a most valuable nature, but for this we must refer our readers to the printed report, or to the Mechanic's Magazine for 1831, selecting only a few notes therefrom.

Mr. GURNEY'S boilers are of cast-iron tube : he works them up to 100 lbs. on the square inch. On plain ground, one wheel, on hilly or slippery, two wheels are connected with the working crank : the facility of stopping by throwing the steam on the opposite side of the piston is so great, that if going 8 miles an hour, a carriage can be brought up within 6 or 7 yards : it can turn in a circle of 10 feet. When moving at a slower rate than 4 miles an hour, the expense of fuel is greater than that of horses. The evaporation of 9 gallons of water per hour is equivalent to one horse power : Mr. GURNEY prefers coke as a fuel, and thinks smoke cannot be consumed without separation of the carbonic acid gas, by passing through lime or other means : considers explosions not always attributable to steam, but frequently to formation of explosive compounds of hydrogen and oxygen, as does GAY LUSSAC.

To provide for accidents from the guide falling asleep, he has contrived that the valves of the engine shall only remain in gear while he is awake and at his post. The moment he takes his foot off, the engine stops : the same contrivance

prevents the carriage running down hill too rapidly, and there is no occasion for drags.

Mr. J. FAREY, engineer, thinks the carriage for conveyance should be upon the same wheels with the engine, to give firmer adherence to the road; approves of the ejection of the waste steam in a stream upwards through a contracted orifice at the bottom of the chimney (introduced by Mr. STEPHENSON on the rail-way engines), as it increases the draught, which from the necessity of a short flue cannot be maintained otherwise, without fans, blowers, or bellows. However Mr. SUMMERS and other engineers object to this plan, as the contracted orifice of the steam escape takes away proportionally from its power on the other side of the piston.

The vertical jet gives such an intensity of draught as was never procured before, and with the further advantage, that the rapidity of draught so produced increases whenever the engines work faster and discharge more steam. This may be considered a very important improvement, as is another described by Mr. R. TREVITHICK regarding the construction of boilers. This engineer has taken out a patent for an entirely new engine, wherein the fire-place, boiler, and condenser stand perpendicularly one within the other: they are formed of six wrought iron tubes. One charge of *distilled water* only is required; the steam being condensed and returned into the boiler by a force pump. To supply the waste by leakage a small apparatus is used, which effectually prevents any fluctuation in the height of water in the boiler, or the collection of sediment, and consequent danger of the boiler becoming heated red-hot.

The boiler is not only less than any other but stronger, and if it were worked at the same pressure as the portable gas-holders, theory would give a saving of fuel, weight, and room over low pressure engines of sixteen to one.

Mr. DAVIES GILBERT explains the apparent anomaly, that with steam power increase of velocity does not enhance expence*.

It was last year determined by the society of civil engineers, that the expence of conveying carriages drawn by horses was at its minimum, when the rate of travelling equalled about three miles an hour; and that expence increased up to the practical limit of speed nearly as the velocity; while on the contrary, friction being a given quantity, as well as the force necessary for impelling a given weight up a given ascent, the power required for moving steam carriages on a rail-way remains theoretically independent of its speed, and practically increases a very little in consequence of resistances from the atmosphere, slight impacts against the wheels, inertia of the reciprocating piston, &c.

The expenditure of what may be called efficiency is as the actual force multiplied by the velocity, and the consumption of fuel in a given time will be in the same proportion: but the time of performing a given distance being inversely as the velocity, the expenditure of fuel in a given time will be constant for a given distance; and it is very nearly so in practice.

* This is the case on land, where friction is constant, but on water the very reverse takes place; for the resistance to motion in fluids increases much more rapidly than the velocity: thus the same expenditure of steam (or coal) that will carry a steamer alone a certain distance, with a given velocity, will with a sacrifice of only $\frac{1}{12}$ of time, convey her with a large ship astern to the same distance. Vide GLEANINGS, III. 158.

Mr. JAMES M'ADAM acquaints us with the fact of the legislature having obliged the tires of all wheels to be free from projecting knobs or nails—a great improvement; he looks to great benefit to the roads from dispensing with horses: weigh bridges are now universally abolished, the effect of carts upon roads being mainly proportionate to the number of horses, according to which the toll is now levied.

Mr. JOHN MACNEILL furnished a variety of very useful experimental tables of the pressure of various carriages upon an inch surface of road;—the weight necesary for their draught with different velocities and on different inclinations;—and he expence per mile for the same. The experiments of the second table were conducted under Mr. TELFORD, with a machine invented by his assistant Mr. MACNEILL for measuring the force of traction, or the labour of horses in drawing carriages. The following are the general results in a tabular form.

Results of experiments made with a stage-coach, weighing, exclusive of passengers, 18 cwt. *on the same piece of ground with different inclinations.*

Inclination.	Rate of travelling.	Force required.	Expence of drawing one ton per mile in a waggon at 2½ miles per hour.
			pence.
1 in 20	6 miles	268 lbs.	22.83
1 in 26	6 ,,	213	
1 in 30	6 ,,	165	18.55
1 in 40	6 ,,	160	16.79
1 in 600	6 ,,	111	12.66
horizontal			12.36
1 in 20	8 ,,	296	[Expence of drawing one ton per mile in a four-horse stage, at 10 miles per hour.]
1 in 26	8 ,,	219	
1 in 30	8 ,,	196	
1 in 40	8 ,,	166	
1 in 600	8 ,,	120	
			d.
1 in 20	10 ,,	318	50.47
1 in 26	10 ,,	225	
1 in 30	10 ,,	200	44.15
1 in 40	10 ,,	172	41.25
1 in 600	10 ,,	128	33.59
horizontal	10 ,,	?	32.93

The following are the same engineer's accurate measures of traction, or resistance, on different qualities of road, which are directly opposed to M'ADAM's theory of road-making, as applied to cities, though not to country.

1.—On well-made pavement, the draught (of each horse?) in a waggon weighing about 21 cwt. is ..... 33 lbs.
2.—On a broken stone surface or old flint road, ... 65
3.—On a gravel road, ... 147
4.—On a broken stone road upon a rough pavement foundation, 46
5.—On a broken stone surface upon a bottom of concrete, formed of Parker's cement and gravel, ... 46

No description is given of Mr. MACNEILL'S dynanometer, but Mr. TELFORD speaks of it in great commendation.

Meteorological Register, kept at the Surveyor General's Office, Calcutta, for the Month of September, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations in Calcutta at 10½ P. M.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.		
1	29,472	81,3	1,1	n. e.	cu.	,543	86,	5,5	n. e.	cus.	,465	87,7	7,8	n. e.	n.	,449	87,3	5,2	n. e.	cu.	,462	83,	1,8	n. e.	cl.	,578	84,3	3,9	s.	cu.	0,31	0,23
2	,522	81,5	2,8	do.	ci.	,579	85,5	5,6	e.	cu.	,498	88,	6,8	do.	cu.	,482	87,5	6,3	do.	do.	,500	83,	3,8	do.	cis.	,583	82,1	1,1	e.	cus.		
3	,551	79,3	1,4	do.	n.	,608	85,	4,8	n. e.	do.	,534	87,	6,3	s. e.	n.	,518	86,	6,3	s. e.	do.	,519	82,	3,8	do.	cl.	,638	81,2	2,8	do.	cl.	0,55	0,41
4	,609	80,7	3,5	n. w.	cu.	,679	84,5	4,8	s. e.	do.	,592	87,9	6,9	s.	cu.	,589	87,5	7,	s.	do.	,585	84,	4,8	s.	do.	,648	82,3	3,7	s.	do.		
5	,609	80,7	3,5	do.	do.	,682	87,	6,1	n. w.	do.	,579	91,3	10,6	cm.	do.	,579	87,7	7,2	s. w.	do.	,574	86,	5,8	s. w.	ci.	,662	84,1	4,7	do.	do.	0,91	0,74
6	,607	80,5	2,8	s. w.	ci.	,674	85,7	7,5	s. w.	do.	,557	89,5	8,8	s. w.	ci.	,551	88,	8,	cm.	cis.	,552	85,	4,8	cm.	cis.	,645	84,0	4,3	do.	cu.		
7	,578	81,5	2,8	cm.	cu.	,646	85,7	4,7	cm.	cis.	,550	86,	6,5	n.	cu.	,530	85,5	5,6	n.	cu.	,529	84,	2,8	n.	do.	,632	84,0	3,9	do.	do.		
8	,564	80,	2,3	s. w.	do.	,608	86,8	5,1	s. w.	cu.	,539	80,5	2,5	cm.	rn.	,508	80,	1,5	cm.	rn.	,508	80,7	1,2	cm.	do.	,577	82,6	4,1	s. w.	cis.	0,64	0,42
9	,525	80,	2,6	do.	cus.	,585	82,7	3,	do.	do.	,492	88,5	8,	s. w.	cu.	,491	84,	3,8	s. w.	cus.	,519	83,	3,8	s.	do.	,626	78,8	2,8	n. w.	cu.		
10	,589	78,	1,1	s.	rn.	,670	84,3	3,6	s.	do.	,605	83,5	4,8	do.	cis.	,598	83,3	4,6	do.	cis.	,599	81,7	2,	s. w.	cu.	,664	81,0	2,8	s.	cis.	0,10	0,07
11	,643	80,5	1,6	do.	cu.	,714	88,5	6,6	s. w.	do.	,627	89,3	8,3	s. e.	do.	,623	87,	5,5	s. e.	do.	,623	83,	2,8	s. e.	ci.	,688	81,6	2,6	do.	do.	0,35	0,19
12	,667	79,5	1,8	n. e.	rn.	,710	84,3	5,6	n. e.	ci.	,601	89,8	8,6	s.	cu.	,591	84,7	5,	s.	cus.	,593	83,	3,3	cm.	cl.	,685	83,2	4,0	s. w.	do.		
13	,632	80,	1,3	n.	cu.	,700	88,5	7,1	n.	cu.	,592	93,3	11,6	n. e.	do.	,574	91,7	11,5	n. w.	cu.	,585	87,	7,1	n. w.	ci.	,676	84,2	7,8	cm.	do.		
14	,610	79,7	1,5	do.	rn.	,685	88,3	8,3	do.	cl.	,592	93,	12,5	s. w.	ci.	,576	92,	11,2	do.	ci.	,579	88,5	7,3	do.	cl.	,670	87,2	6,0	do.	do.		
15	,646	82,	2,8	n. w.	cu.	,697	88,7	8,2	n. w.	cu.	,606	93,3	12,1	n. e.	cu.	,584	92,8	11,8	do.	cu.	,574	89,	8,3	do.	cu.	,667	89,0	6,7	w.	cl.		
16	,664	79,5	1,3	do.	cus.	,709	86,	5,5	do.	do.	,599	89,5	7,3	do.	do.	,585	89,	6,8	n. w.	do.	,582	86,	4,8	do.	do.	,679	80,0	1,1	s. w.	rn.		
17	,607	80,	1,8	s. w.	cu.	,647	85,5	6,	s. w.	do.	,543	83,5	3,5	s. e.	n.	,544	83,3	3,6	s. e.	cus.	,487	79,5	2,8	s. e.	n.	,639	82,0	4,4	s.	cus.		
18	,591	81,3	3,3	s. e.	do.	,645	85,5	6,3	s. e.	ci.	,546	85,7	5,	do.	do.	,556	81,7	3,	do.	n.	,572	80,5	3,3	do.	cus.	,675	81,1	3,1	s. w.	cl.		
19	,663	78,7	1,5	do.	rn.	,733	86,5	5,5	do.	cu.	,689	78,7	1,2	cm.	rn.	,690	78,5	1,	cm.	rn.	,666	78,7	1,	do.	cis.	,783	79,8	1,8	s. e.	rn.	0,10	0,07
20	,735	78,5	1,	n. e.	cus.	,805	84,	3,8	n. e,	do.	,720	87,7	6,	s. e.	cu.	,723	79,	2,8	do.	do.	,707	79,5	1,3	cm.	rn.	,799	81,1	2,4	e.	cus.	0,68	0,50
21	,746	78,5	1,3	cm.	cis.	,789	86,5	5,8	s. e.	do.	,681	83,5	3,6	e.	cis.	,661	82,5	3,3	s. e.	cus.	,664	81,	2,8	s. e.	cu.	,741	79,3	2,6	w.	cl.	0,39	0,28
22	,747	76,	0,8	s. e.	rn.	,775	80,3	3,1	do.	cis.	,673	81,3	3,4	s. e.	do.	,659	81,	2,8	do.	cis.	,655	79,7	2,5	do.	cis.	,736	78,8	2,8	s.	do.		
23	,710	76,5	1,1	s.	cy.	,763	81,5	3,3	do.	do.	,706	78,5	2,8	s.	rn.	,694	79,	2,8	s.	cus.	,694	79,	1,8	s.	do.	,801	78,3	2,2	do.	cu.		
24						,845	77,	1,3	s.	rn.	,743	77,7	1,2	s. e.	cis.	,723	78,3	1,4	s. e.	cis.	,739	79,	1,3	cm.	ci.	,777	78,0	2,1	do.	cl.	0,67	0,51
25	,713	78,	1,3	s. e.	rn.	,770	80,	2,5	s. e.	cus.	,646	84,0	4,8	do.	cu.	,652	83,	4,3	s.	ci.	,632	81,	2,8	s.	do.	,723	79,1	2,0	s. e.	do.	0,13	0,10
26	,678	78,3	2,1	do.	cus.	,732	86,	4,3	e.	cu.	,655	88,5	8,5	do.	do.	,638	86,5	6,	s. e.	cu.	,642	84,	4,3	cm.	cus.	,754	81,1	2,9	e.	do.		
27	,727	78,	1,8	n. e.	do.	,795	82,7	3,2	n. e.	ci.	,701	86,6	6,4	n. w.	do.	,704	82,	3,8	s. w.	cus.	,698	79,5	2,3	do.	do.	,809	79,7	3,7	cm.	do.	0,15	0,11
28	,782	77,	1,3	s. e.	rn.	,865	85,	6,1	s. e.	cu.	,794	84,5	5,	s. e.	cis.	,764	82,5	3,6	s. e.	cis.	,754	81,	2,8	s. e.	cis.	,851	79,8	2,6	s.	do.		
29	,839	77,5	1,3	s.	cu.	,893	84,7	6,2	s.	do.	,778	89,5	9,3	n. w.	cus.	,773	89,3	8,3	n.	cu.	,776	87,	3,8	n.	cu.	,839	82,3	3,5	do.	do.		
30	,811	79,	0,8	w.	cl.	,850	82,0	1,8	w.	do.	,726	89,5	7,6	s.	cu.	,723	88,	6.3	s. w.	do.	,743	84,0	2,8	s. w.	cu.	,825	85,0	4,0	s. w.	cu.	0,04	0,03
Mean,	29,650	79,3	1,9			,713	84,8	5,0			,620	86,6	6,6			,611	84,0	5,3			,610	82,7	3,5			,702	81,5	3,4			4,88	3,63

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain; ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*